**TABLE SAW TECHNIQUES**

# TOP TIPS FOR CUTTING DADOES

## Get Dead-On Results Every Time

# ShopNotes®

Vol. 16 Issue 91

**PLUS!**
**EASY-TO-DO PLANER MAKEOVER**
For Top-Notch Performance!

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- Adjustable Outfeed
- Tool Storage pg 18

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A Publication of August Home Publishing

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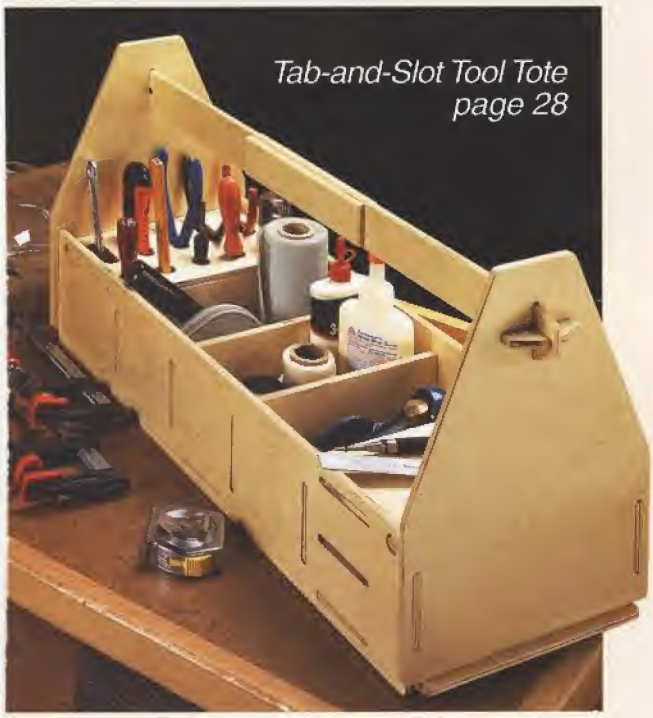

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# Cutoffs

From thick to thin. When you think about it, that's really all a planer does. It takes thick boards and makes them thinner.

But what a difference it can make when it comes to building projects. With a planer, you can accurately thickness your workpieces to suit the project. This means you can cut tighter-fitting joints, create glued-up tops a consistent thickness, and turn rough stock into glass-smooth workpieces with little effort.

The thing is, over time a planer can get out of adjustment and when that happens it can cause more problems than it solves.

That's exactly what had happened to Bryan Nelson's planer. (Bryan is the Managing Editor). After years of service, his planer just wasn't cutting it any more (pun intended). What it needed was a full-scale tune-up. With a handful of supplies and just a few simple tools, his planer was back to peak performance in just an afternoon. You can find out exactly what you'll need to do to get your planer running smoothly by checking out the article starting on page 40.

Speaking of planers, be sure to take a look at the mobile planer stand on page 18. It's another great way to improve the performance of your planer. It features handy storage along with a solid outfeed support system that folds out of the way when you don't need it.

Terry

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This symbol lets you know there's more information available online at **www.ShopNotes.com**

from our Readers

# Tips for Your Shop

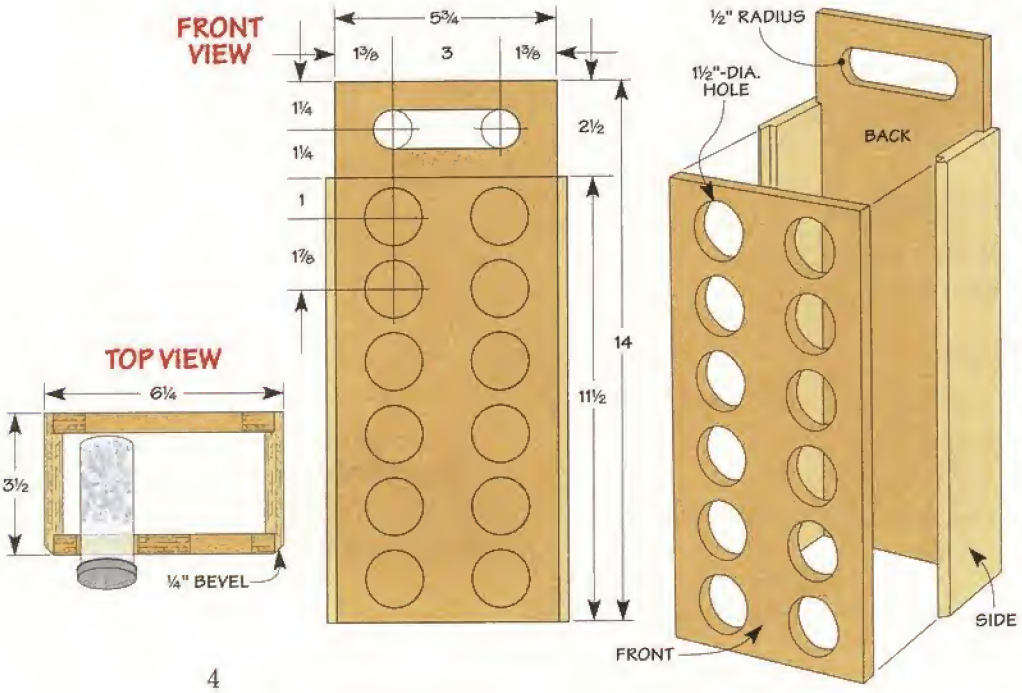
## Small Parts Organizer

Keeping assorted screws, bolts, and other pieces of small hardware organized and easily accessible is always a challenge in my shop. It seems I can never find the part I want or it's always at the other end of the shop. To solve this problem, I built the small parts organizer you see in the photo at right. It stores the small parts I use most often.

The organizer holds a dozen 1⅜" x 4" clear plastic tubes that I ordered from *Lee Valley* (27K6011). These tubes let you quickly and easily see the contents stored inside.

It keeps a wide range of parts in one place and is compact enough to sit on a workbench. Or you can pick it up by the handle and quickly carry everything to the job site.

The organizer is easy to build. You can begin by cutting four pieces of ½" plywood to size. You'll want to make the back longer so you can make a cutout for the handle. Then just cut a rabbet along the edge of each side to join the front and back as shown in the drawing at left.




Before assembling the organizer, you'll need to cut some round openings for the tubes, like you see in the Front View at left. I used a 1½"-dia. Forstner bit to drill out these holes. The holes are slightly larger than the outside diameter of the tubes. This makes it easier to slip the tubes in and out of the rack. And when the tubes are filled, the larger holes also allow the tubes to sit at a slight angle so they won't fall out when you carry it around.

Now all that's left is to glue the sides, back, and front together. Then you can fill the tubes with your small parts, slip them into the organizer, and you're ready to go.

*Rex E. Burgett*
*Clarinda, Iowa*

# Modified Plywood Workstation

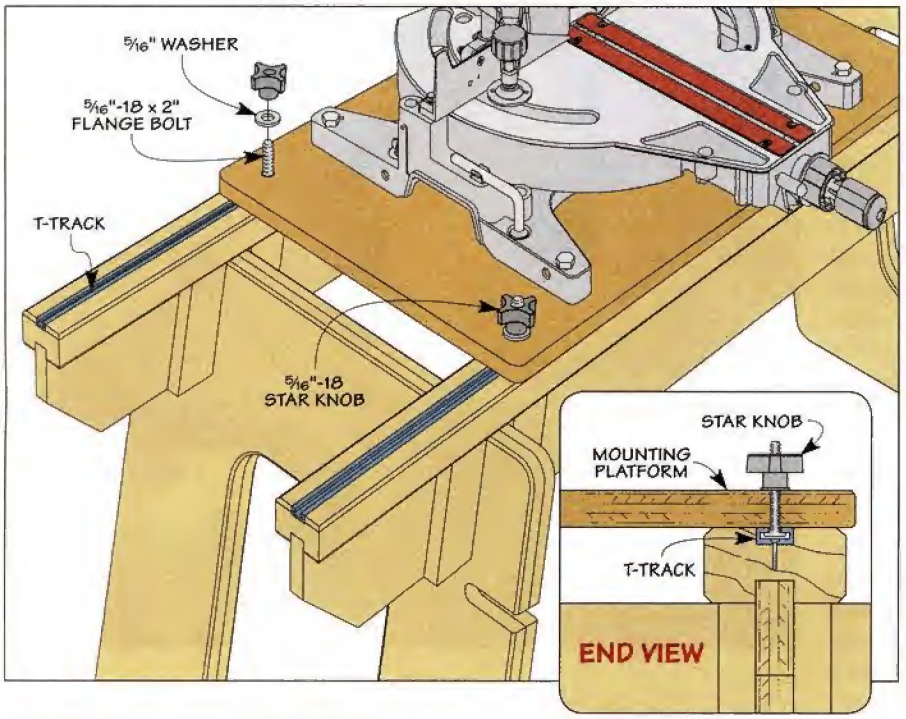
I really like the versatility of the knock-down workstation I built from Issue No. 87. And after making just one slight modification, I use it more than ever.

To make the modification, I used the dado blade on my table saw to cut a ¾"-wide groove on the top of each rail. Then I installed a T-track in each groove.

Next, I drilled holes in the mounting platform of each of the accessories I use with the workstation. Each hole is positioned over the T-track on the rail. Then simply insert a flange bolt, washer, and a star knob in each of the holes.

Now when I need to change one of the accessories, all I need to do is slip the platform on the T-track and tighten the knobs as shown in the drawing below.

*Fred Suplee*
*Riverside, California*




## Submit Your Tips

If you have an original shop tip, we would like to hear from you and consider publishing your tip in one or more of our publications. Just write down your tip and mail it to: *ShopNotes,* Tips for Your Shop, 2200 Grand Avenue, Des Moines, Iowa 50312. Please include your name, address, and daytime phone number (in case we have any questions). If you would like, you can FAX it to us at 515-282-6741 or simply send us an email message at: shopnotes@shopnotes.com. We will pay up to $200 if we publish your tip.

## The Winner!

Congratulations to Gary Mastolier of Homer, Alaska. His tip on making a rip cut hold-down guide was selected as winner of the *Porter-Cable* router just like the one shown at the right. The hold-down guide allows stock to be cut quickly and safely without a lot of set-up time.

To find out how you could win a *Porter-Cable* router check out the information above. Your tip just might be a winner.

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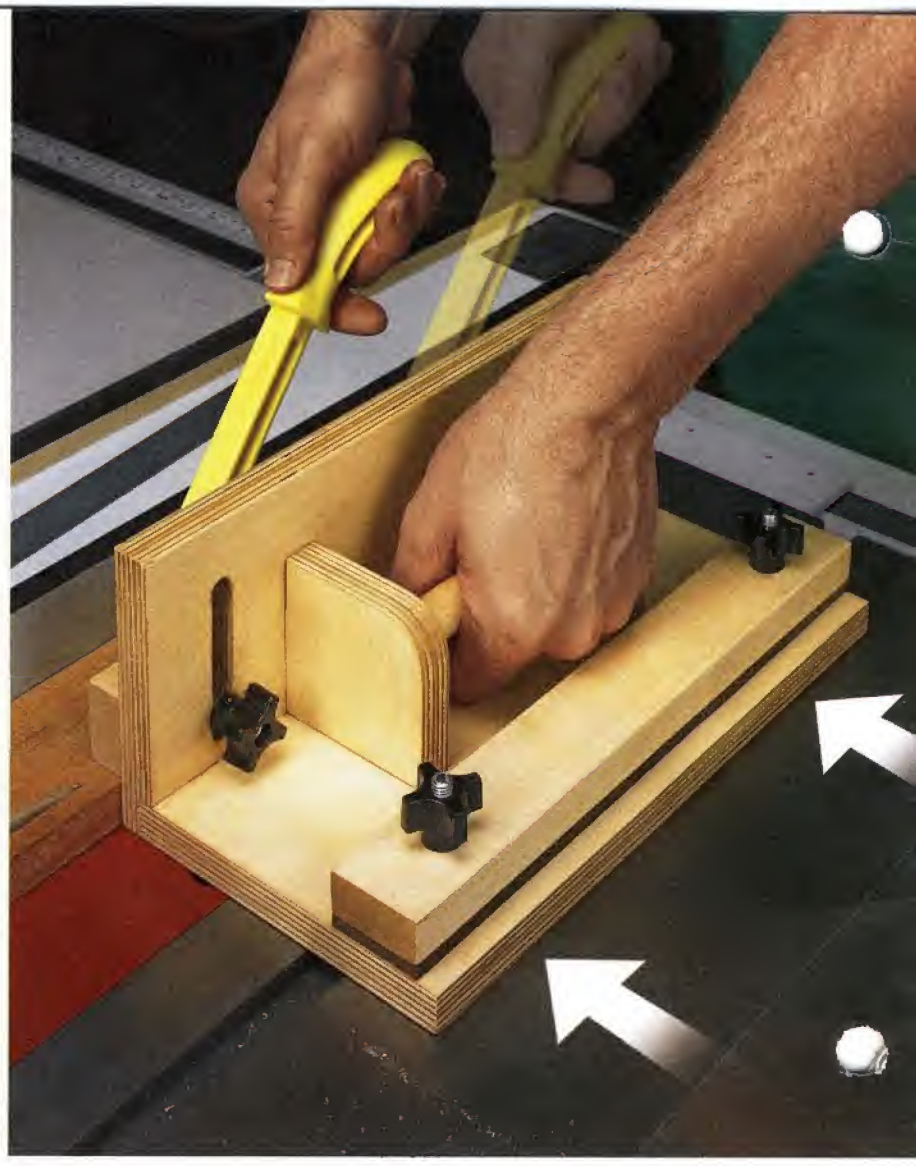
# Rip Cut Hold-down Guide

Whenever I need to rip a piece of stock, it always takes extra time to correctly set up and adjust the featherboards and hold-downs needed to make the cut safely. To make this task quicker and easier, I built the hold-down guide you see in the photo at right.

The hold-down guide prevents kickback and lifting of the workpiece. Plus, it doesn't take much time to set up and it's easy to use.

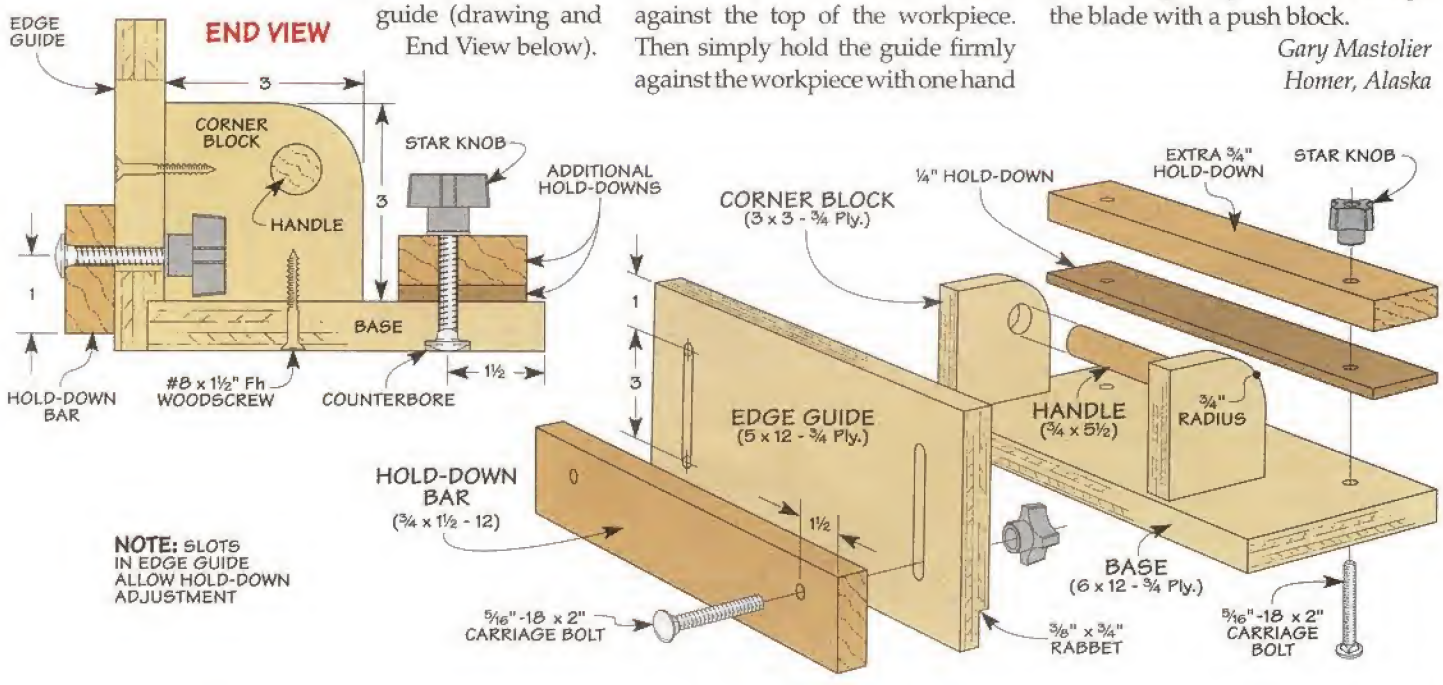
I used ¾" plywood to build the guide. You can begin by cutting the base to size. Then make the edge guide by simply cutting a rabbet along the bottom edge to fit against the base. As you can see in the drawing below, I cut a slot at each end to insert a carriage bolt with a star knob for adjusting the height of the hold-down. Finally, add two corner blocks for support and a dowel for the handle.

Next, cut a piece of hardwood for the hold-down bar. Then you'll need to drill a hole at each end. Position these holes to fit in the slots you cut in the edge guide. I made an extra ¾" hardwood hold-down and a thinner one from ¼" hardboard at this time as well. These can be stored right on the guide (drawing and End View below).



To use the guide, place the workpiece against the fence on the saw table and secure the hold-down bar against the top of the workpiece. Then simply hold the guide firmly against the workpiece with one hand (the guide doesn't move) and use your other hand to feed the workpiece along the guide and through the blade with a push block.

*Gary Mastolier*
*Homer, Alaska*



# Sheet Goods Cart

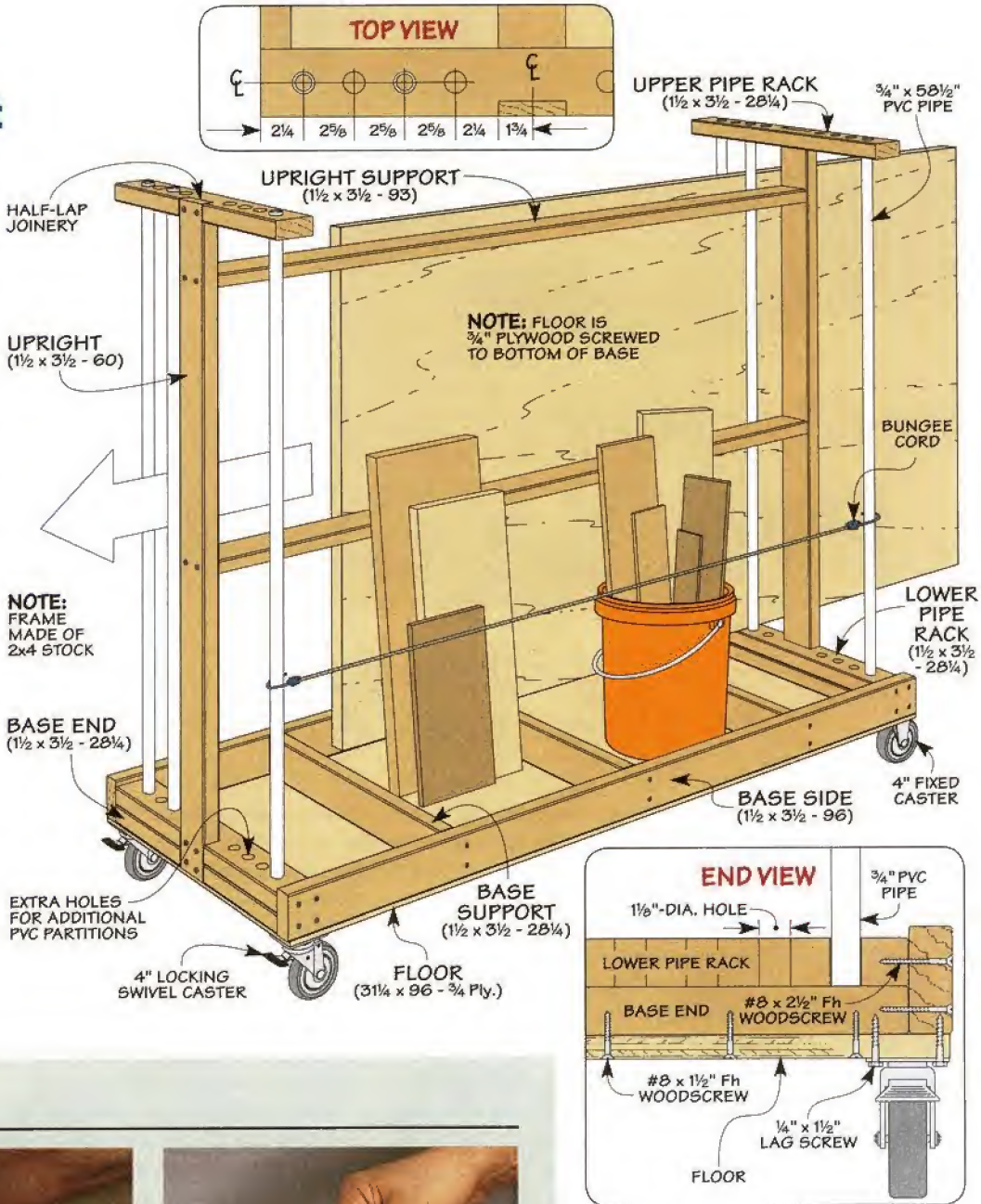
Storing assorted scrap pieces of plywood and MDF is always difficult. Because of their size, these sheets usually end up leaned against the wall, taking up valuable wall space. And the larger pieces always seem to hide the smaller pieces, making them hard to find.

To solve this problem, I built the cart you see at right for storing and organizing sheet goods. The cart has two sides. One side is designed to hold larger pieces. And the other is made to store smaller sheets and plastic buckets for small odds and ends of various sizes.

The cart is built using 2x4's for the base and uprights. Lengths of ¾" PVC pipe are used to make partitions for holding larger sheets on one side of the cart. A single PVC pipe is used on the other side and provides a place to hook a bungee cord for holding smaller pieces and plastic storage buckets in place.

I placed the cart on a set of casters. This way, it's easy to move around.

*Leslie Harrison*
*Bremerton, Washington*




## Quick Tips

▲ ***Ellis Biderson*** *of Huntington Beach, CA, uses a funnel to help manage small parts after he is done using them. He simply positions the funnel over an open container and then scoops the parts into the funnel to return them to storage.*

▲ ***Steve Russell*** *of West Salem, WI, removes the center post from a used CD container and then stores the sanding discs for his orbital sander inside.*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# working with Profile Bits

## Adding a decorative edge to a project with a hand-held router is a breeze if you follow a few simple rules.

I use my router on just about every project I build. More often than not, it's to put a profile on the edge of a workpiece. With an almost endless selection of profiles to choose from, it's an easy way to add a decorative design to a project. There are, however, a few things to keep in mind to get top-quality results.

**Choosing a Bit**. Successfully routing a profile starts by selecting the right bit. Fortunately, you have a lot of options here. The bits I use most often in my shop are shown in the photos below. I often use roundover or chamfer bits to soften the corners of legs and other edges. I also like cove and ogee bits for decorative edges. They come in a wide selection of styles and sizes to provide a classic look. And by combining profiles, you can create just about any design you like.

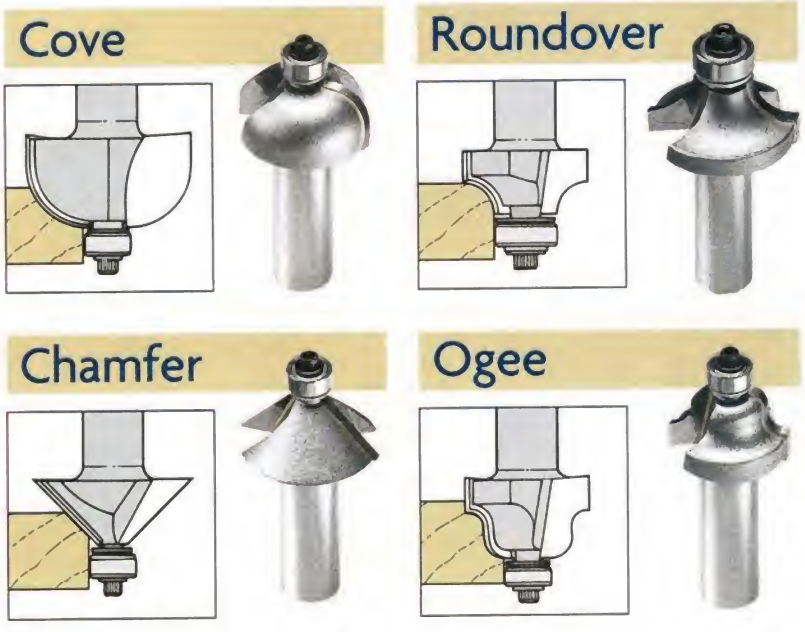
**The Cutting Edge**. After you've decided on the profile for your project, there are some other things to look for in a good-quality bit. The first is the cutting edge. Although you can still find high-speed steel, I prefer carbide-tipped bits. The carbide edge stays sharp longer.

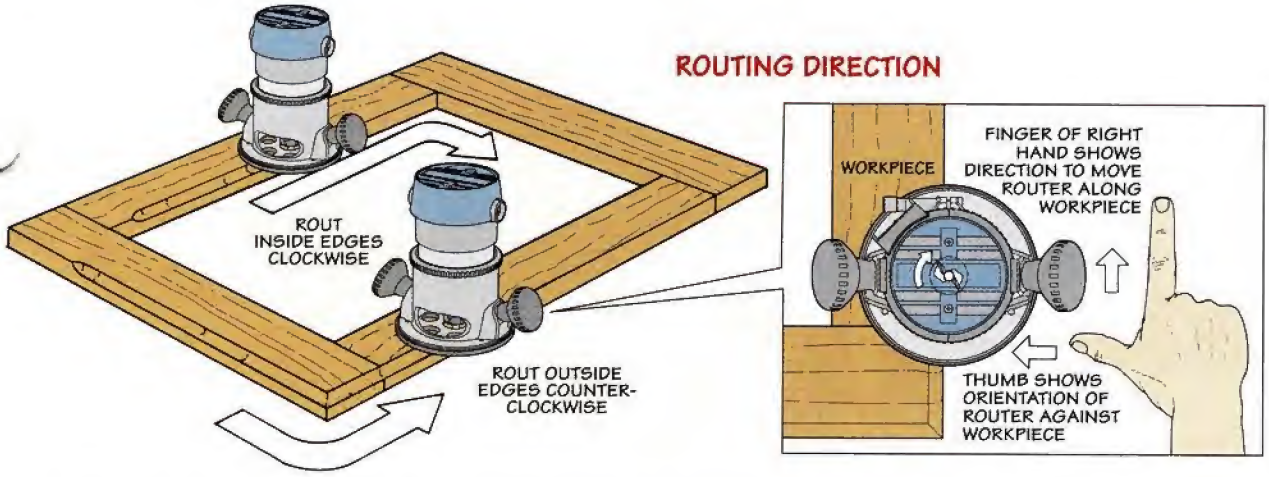
**Shank Size**. Another thing that can affect the quality of the cut is the shank diameter of the bit. Bits with a ¼"-dia. shank can chatter and leave a rough cut, especially with a large bit. So I prefer to use ½"-shank bits whenever possible.

**Bearings**. One thing most profile bits have in common is that they have a guide bearing. That is, a ball bearing on the bottom of the bit will ride on the smooth edge of a workpiece and control the cut. Be sure to check the condition of the bearing before every use. If it's dirty and doesn't spin freely, you can usually clean it. If that doesn't work, you may need to replace the bearing before using the bit.

**Routing Techniques**. With the right bit installed, you're about ready to move on to routing the edge. But first you'll want to secure the workpiece. It's hard to get good results if you don't have it firmly held in place. And you run the risk of the bit catching the grain and gouging the workpiece.

▲ ***Shank Size.*** *The larger, ½"-dia. shank is less prone to chatter.*






The good news is, securing the workpiece is pretty easy to do. The surest way is to fasten it to your bench with hand clamps or bench dogs and a vise. The problem with this method is that you can only rout part of the workpiece before you have to reposition the clamps.

I like to use a router pad to avoid the constant reclamping. It grips the wood safely under the downward pressure of the router. And when you need to reposition the workpiece, you just lift it off the mat, turn it, and start routing.

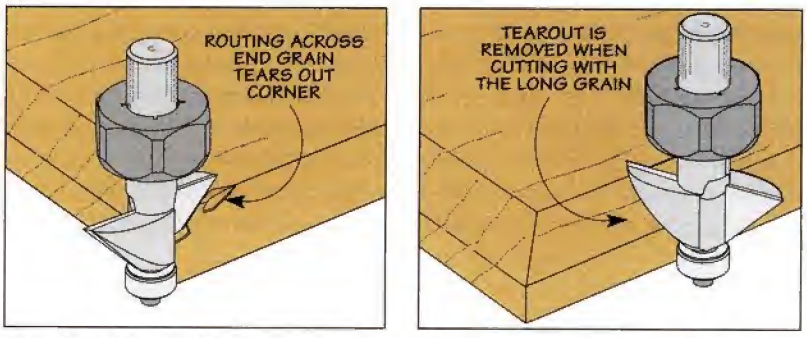
**Make Multiple Passes.** Now that you've secured the workpiece, you're ready to rout the profile. Here's where a little patience makes all the difference. I like to take the time to make a test piece out of the same stock as the project.

One of the main reasons for this is to determine how well the bit cuts and how deeply I can cut without causing tearout or burning. If you try to "hog" off too much in a single pass you'll spend even more time trying to clean up gouges or burn marks later. I get the best results when I make multiple, shallow passes. Even if the last pass is only a very thin clean up, the results are worth the extra effort.

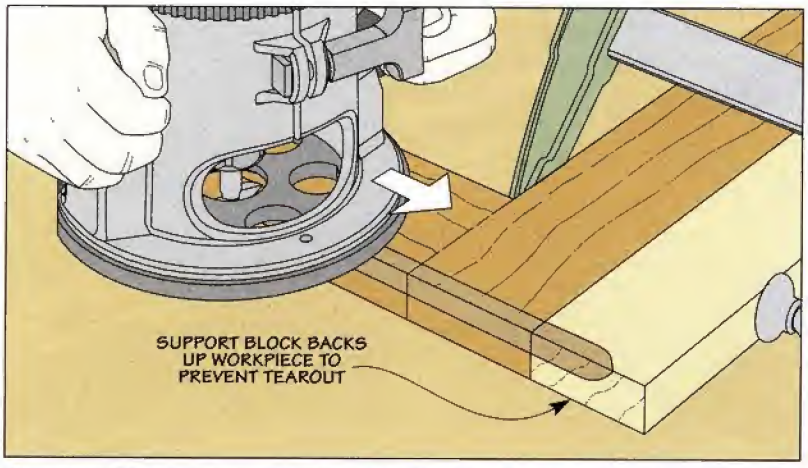
**Which Direction?** Another thing to remember is it's important to rout in the right direction. The illustrations above show you what I mean. For an outside edge, move the router in a counter-clockwise direction. If you're routing the profile on the inside of a frame, move clockwise. This rule will help you avoid a "climb cut" that pulls the router away from the workpiece.

You'll also need a strategy for routing end grain without causing tearout. The answer here is to start with the end grain first. Then the following long-grain cuts will clean up any tearout. But sometimes you may have a panel where one edge is left square, for instance a cabinet top that will sit against a wall. In that case, you can clamp a backer board to the workpiece. Both methods of preventing tearout are shown in the illustrations below.

Finally, listen to the sound of your router, it can tell you a lot about the cut. If it's bogging down, then it's best to take a shallower cut or go a little slower. With these tips in mind, you'll be well on your way to successful profile routing.




***Rout End Grain First.*** *Since tearout happens when routing across end grain (as in the left drawing), rout it first. Then, when you rout the long-grain edge, the cut will remove any areas that are chipped out.*




***Support Block.*** *To prevent tearout when the long-grain edge will not be routed, clamp a support block to the edge of the workpiece. The block supports the corner and prevents the workpiece from tearing out.*

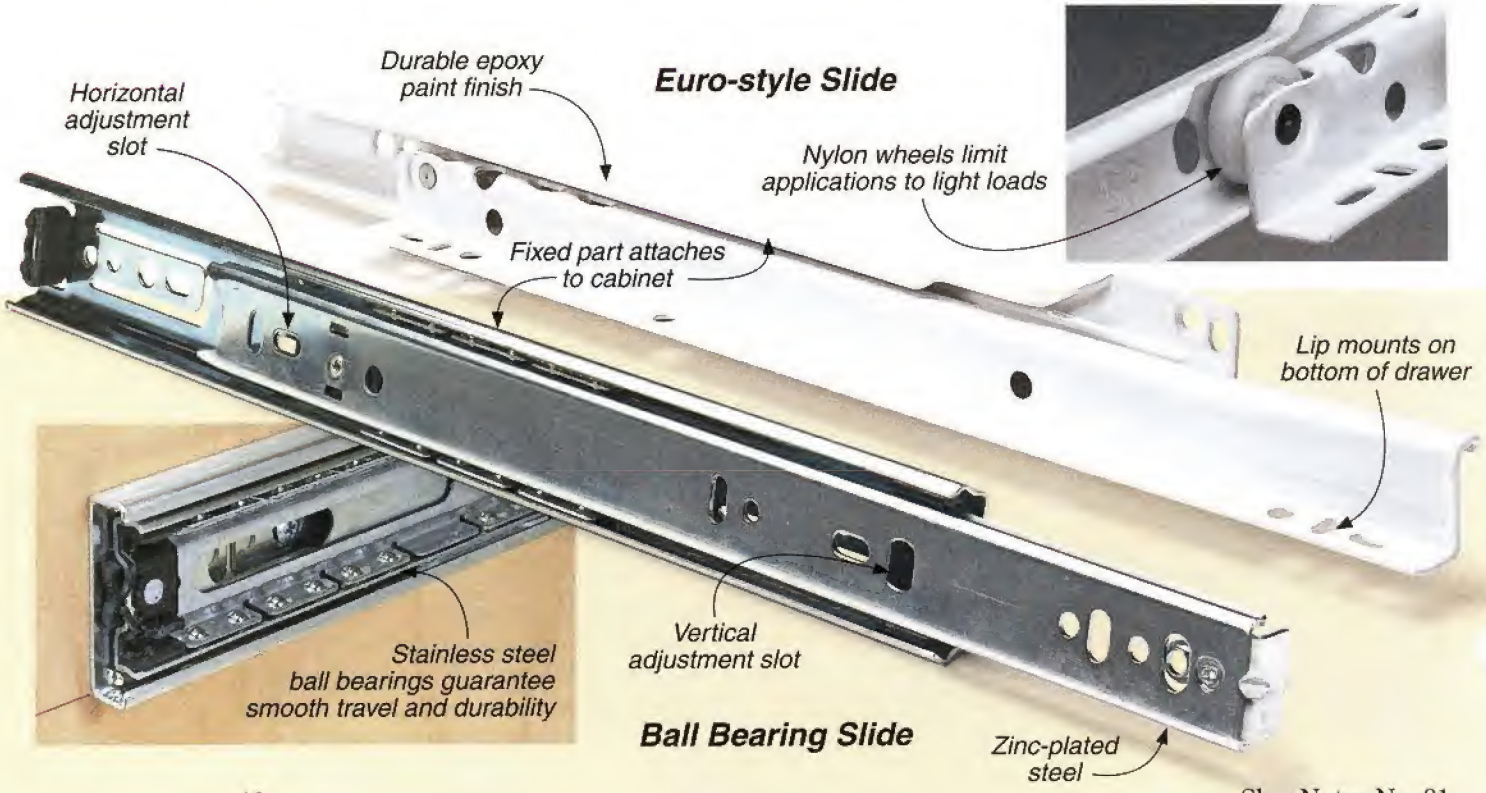
# choosing Metal Drawer Slides

When it comes to building drawers for a shop cabinet, or any drawer that will be carrying a lot of weight, I incorporate metal drawer slides into the design. Their solid construction guarantees a smooth rolling drawer regardless of changes in temperature or humidity.

Metal slides can reliably handle loads up to 100 lbs. without binding or sticking. And they're available in several different designs, with options for partial or full extension (and even beyond). Metal slides are also pretty easy to install and even allow you a little "wiggle room" to adjust for a perfect fit.

**Slide Selection.** With so many different styles on the market, however, you'll need to determine which style is best suited for your project before you begin. The good news is that most metal drawer slides require ½" clearance on each side for installation. That makes it easy to figure drawer sizes and openings. And they can accommodate either face-frame or frameless cabinet design.

On the next few pages you'll see a few of the choices available. You can find ordering information in Sources on page 51.

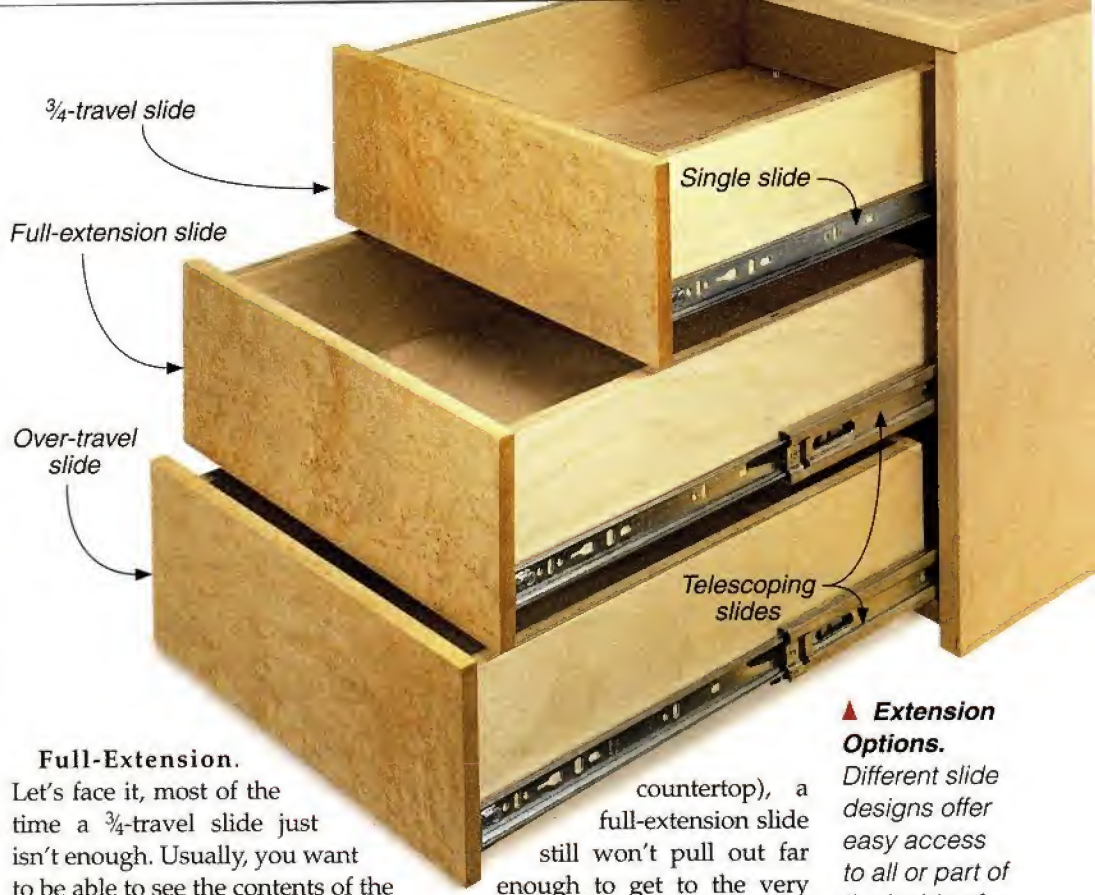


**Euro-Style.** For drawers that won't be supporting a lot of weight, the epoxy-painted, Euro-style slide is an inexpensive answer. At $5 - 6 a pair, they may be all you need.

Chances are you already have some of these in your house. They're the standard, two-piece slide used on kitchen drawers. Euro-style slides are popular not only for their low cost, but also for ease of installation. As you can see in the illustration below and the photo on the opposite page, they have a lip on the edge, making alignment with the drawer bottom automatic. To top it off, they're available in a variety of colors.

**Nylon Wheels.** The downside of this type of slide is that it travels on nylon wheels. And while they're advertised to handle loads up to 75 lbs., they won't have a very long life under that load. Another limitation of the Euro-style slide is that it only offers ¾ travel. That is, it only opens far enough to expose part of the inside of the drawer.

**Ball Bearing Slides.** For some applications, a ¾-travel slide may be enough. But the problem comes when the drawer needs to support a lot of weight, like those in most cabinets in a shop. In that case, I turn to side-mounted, ball bearing slides. Commonly available in zinc-plated steel, black, or white enamel paint finishes, these slides are about twice the cost of the Euro-style slides. But the steel ball bearings can handle a load up to 100 lbs. for many years to come.




▲ ***Extension Options.*** *Different slide designs offer easy access to all or part of the inside of a drawer.*

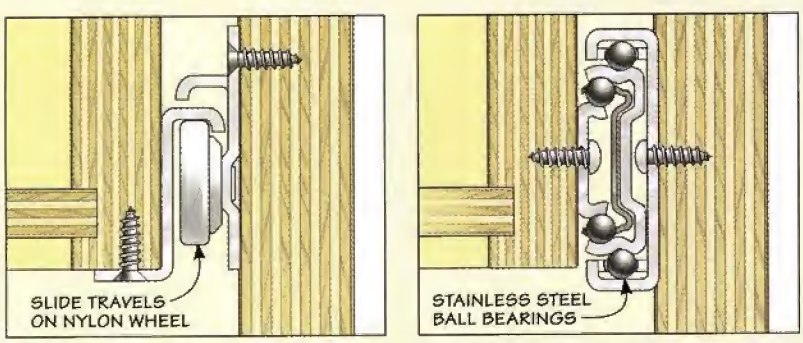
**Full-Extension.** Let's face it, most of the time a ¾-travel slide just isn't enough. Usually, you want to be able to see the contents of the entire drawer. And a full-extension slide allows you to do just that.

This is possible because the slide is a three-piece assembly that telescopes out to the full length of the drawer. You can compare that design to the Euro-style slide in the illustrations below. Stainless steel ball bearings make for smooth travel and ensure solid performance over the years. You can expect to pay $12-15 for a pair.

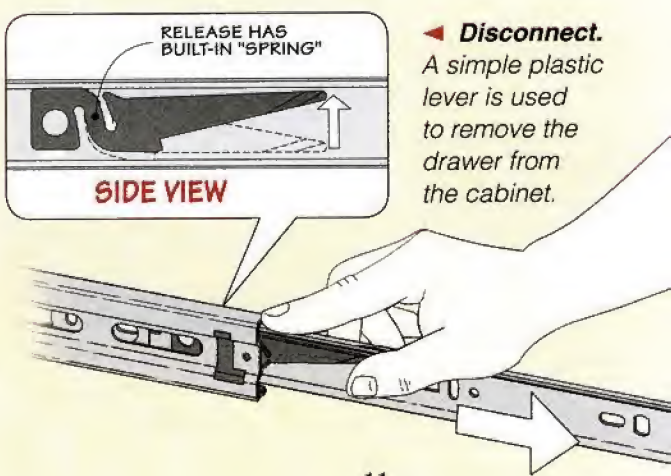
**Over Travel.** For some applications a full-extension slide doesn't go quite far enough. For instance, if you have a cabinet with a top that extends past the front face of the cabinet (like with a typical countertop), a full-extension slide still won't pull out far enough to get to the very back of the drawer. Over-travel slides solve this problem by extending past the front of the cabinet. They only offer an extra inch of travel, but that may make a difference for some applications. For example, file drawers often feature an over-travel slide. They can handle the weight and offer access to the very last file.

Once again, the construction here is a three-piece steel body with steel ball bearings. And they're priced between $17-20 per set.

After you've chosen the right slide, you're halfway home. On the following pages, I'll show you an easy technique for installing them.




▲ ***Design Differences.*** *The Euro-style slide (left) uses a nylon wheel rolling on the cabinet-side track. The ball bearing slides (right) support the weight of the drawer on a set of stainless steel bearings.*




◀ ***Disconnect.*** *A simple plastic lever is used to remove the drawer from the cabinet.*

# drawer slide Installation

**Drawer Location.** *Locating the drawer slides starts by placing the drawers and slides in the cabinet and marking their positions.*

Installing metal drawer slides can seem a bit intimidating. The box on the next page shows a couple of commercially available jigs to help you out, but I've found a simple shop method that eliminates complicated measuring for each drawer slide. For this I like to use the drawers themselves to mark the position. The idea is to use an MDF spacer to install the slide accurately, and keep both sides level. The photos below show this procedure on a frameless cabinet, but it works for face frame cabinets as well. I'll discuss the differences a little later.

**Getting Started.** The first step is to install the slides on the drawers. For convenience, I usually place them on the lower edge of the drawer. Here, I use the slotted horizontal holes to attach the slide. Using these holes allows me to make small adjustments as needed.

Then, I assemble the slide so both pieces are attached to the drawer. Now, with the cabinet turned on its back, I put each of the drawers in position, as shown in the photo above. The drawers simply rest on the back of the cabinet.

**Mark the Location.** Once the drawers are in the proper place, I mark the bottom of each of the slides on the side of the cabinet, using a square. Once that's complete, I remove the drawers and cut a spacer to the length of the mark for the top drawer.

**Using Spacers.** After clamping the spacer in position for the top drawer, you can use it to support the slide while you attach it to the cabinet side, as shown in the left photo below. For this, I use the slotted vertical holes.

Now, using the same spacer, you can attach the slide to the opposite side. Once both slides are in place, insert the drawer and test it for a smooth-rolling fit. You can then make small adjustments both horizontally (on the drawer piece) and vertically (on the cabinet piece) to

► ***Using a Spacer.*** *Rest the drawer slide on the spacer and install the screws. After transferring the mark for the lower drawer slide to the spacer, cut it to length and repeat the process.*

SHOP TIP ►

## False Fronts

Adding false fronts to drawers is an easy way to conceal the slides. To make sure the fronts are properly aligned, first lay them out using thin shims to maintain even spacing. Use some carpet tape to temporarily attach the fronts to the drawers. Then permanently attach them with screws from the inside.

fine-tune the position. Once you're sure of the placement, you can add a couple of screws in the round holes to fix the position.

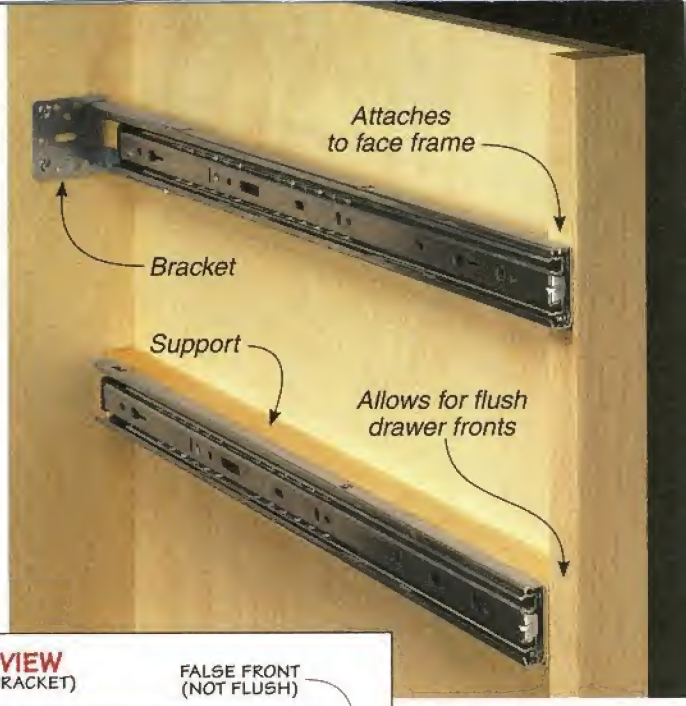
**Cut the Spacer.** The next step is to transfer the mark for the next drawer to your spacer (middle photo). Using that mark, you can cut it to the correct size and repeat the installation process for the rest of the drawer slides (right photo).

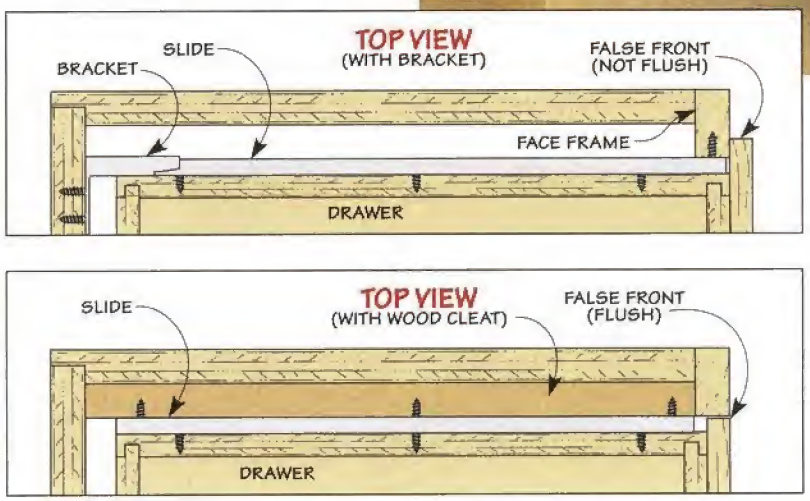
**Face Frame Cabinets.** The procedures up to this point have all used a frameless cabinet. And the same techniques can also be used with face frame cabinets. But there are a couple of different options for mounting the slides.

**Face Frame Hardware.** One way to add slides to face frame cabinets is to buy a mounting bracket to match the slide. The bracket attaches to the back of the cabinet and allows you to align the slide to match the overhang of the frame. The front part of the slide attaches directly to the inside of the frame, like you see in the photo at right.

**Shop-Made Supports.** There's also an easy, shop-made solution. All you really need to do is plane a piece of stock to match the overhang of the frame. Then you can use it as a support by attaching it directly to the cabinet side. Once it's in place, you can follow the same procedure I outlined earlier to position and mount the slide hardware to the support.

**False Fronts.** If you're going to add false fronts to the drawers, now is the time. You'll find a handy tip for aligning them on the bottom of opposite page. Now you can enjoy the easy operation that only a metal drawer slide can provide.




▲ ***Face Frame Solutions.*** *A hardware kit is one way to mount a drawer slide. (top). Another is a support attached to the side of the cabinet (bottom).*

# Slide Installation: Handy Jigs

For every installation task in the shop, it seems like there's a jig to help you. Drawer-slide installation is no exception. The two jigs shown at right both do the same job, but in very different ways. To use either jig, however, you'll first need to determine the placement of the slide and mark a centerline.

The *Kreg* jig holds the cabinet portion of the drawer slide in place with a magnet. With the slide attached, you simply clamp the flat face square to the cabinet, as shown in the top photo at right. Then, all you need to do is add the screws. (The jig is designed to allow access to the holes in the slide.) The nice thing about this jig is that it's easy to use and it will work with most types of metal drawer slide hardware.

*Rockler's Jig-It* for *Accuride* slides features an acrylic panel that's marked for positioning slides of the most commonly used lengths. After aligning the guide, you use a self-centering bit to drill pilot holes based on the length of the slide. With the holes in place, it's a simple matter to position the hardware and add the screws.

***The Kreg Jig.*** *A magnet holds the slide in place while you install the screws.*

***Rockler's Jig-It.*** *This jig marks the position for drilling pilot holes.*

# commercial Featherboards

## Maintain control with these easy-to-use accessories.

Featherboards are a must-have helper in any shop. They hold stock firmly against the fence or table of a band saw, router table, or table saw. To do this, they have angled, flexible "fingers" to apply constant pressure against a workpiece to prevent kickback as the workpiece is being pushed along the fence. Plus, your fingers stay safely away from the spinning blade or bit.

You can make your own featherboards, but they can be a hassle to line up correctly and clamp in place. To avoid this, I've turned to commercial featherboards.

▲ **Fence Mount.** *A fence-mounted featherboard (Rockler) improves the cut by providing downward pressure on a workpiece.*

▲ **Miter Slot.** *Securely locked into the miter slot by a pair of "cleats," this featherboard from Big Horn holds a workpiece tight against the fence.*

As the photos show, these featherboards share features and have improvements over shop-made ones. You'll notice right away that most of them are made from plastic. So they're durable, maintain their shape, and won't damage a workpiece (refer to Sources on page 51).

**Easy Installation.** Another advantage they have is how easily they attach to a fence or table.

Instead of clamps, some featherboards, like the *Rockler* model at the far left, use flange or hex bolts that lock it into a T-track installed in a fence. Although it appears small, the *Rockler* model ($12) is quite beefy. Its size makes it perfect for use on a router table fence.

If you'd like to use a featherboard to hold a workpiece tightly against a fence, you'll want to check out the *Big Horn* featherboard ($10) in the right

photo at the bottom of the opposite page. It features cleats that fit into any standard miter gauge slot. Turning the knobs expands the cleats, locking the featherboard in place. Plus, the longer adjustment slots provide for a wider range of uses.

**Feather-Loc.** For the "ultimate" featherboard, check out the heavy-duty *Feather-Loc* ($25) by *Bench Dog* (far right photo). A simple version of this featherboard uses hex bolts to secure it in a T-track and another model features an adapter that you can use in your miter gauge slot. You can see both in the main photo. All it takes is a quick twist of the knobs for a secure lock. And if you need support for a tall workpiece, you'll find the "stacked" setup shown above to be the perfect choice.

▲ ***Double-Decker.*** *Feather-Locs can be combined to provide support for tall stock.*

But the feature I like best is the lead "finger," which is a hair shorter than the others. When setting up the featherboard, place the workpiece against the fence and then adjust the featherboard so the short finger just touches the workpiece. After you tighten it down and start pushing the workpiece through, the remaining fingers are in perfect position to apply just the right pressure to hold the workpiece.

**Other Options.** Take a look at the photo at left and you'll see a featherboard ($12, *Lee Valley*) that uses a built-in aluminum "thumb" to hold the workpiece flat against the table while a set of hardwood fingers press it tight against the rip fence. Finally, the box below features a unique featherboard that doesn't require a miter gauge slot at all.

No matter what type of featherboard you choose, you'll find them all simple to use, while providing safety at a reasonable cost. And once you give them a try, I think you'll find them worth it.

▲ ***Double-Duty.*** *This hardwood featherboard combines sideways pressure on the workpiece with an aluminum "thumb" to hold the workpiece securely against the saw table.*

# Magnetic: Grip-Tite Featherboard

Unlike most commercial featherboards, the *Grip-Tite* ($39.50) shown at right doesn't require a miter gauge slot or T-track to secure it in place. Instead, it uses a powerful magnet built into the base.

To hold the workpiece against a fence, the *Grip-Tite* uses flexible wings to serve as the fingers. And a hold-down that slides through the handle keeps the workpiece flat on the table. Finally, when you need to remove the *Grip-Tite*, all you have to do is simply twist the release lever on the rear of the body.

***Magnetic Base.*** *The Grip-Tite featherboard can be attached virtually anywhere you need it on your table saw.*

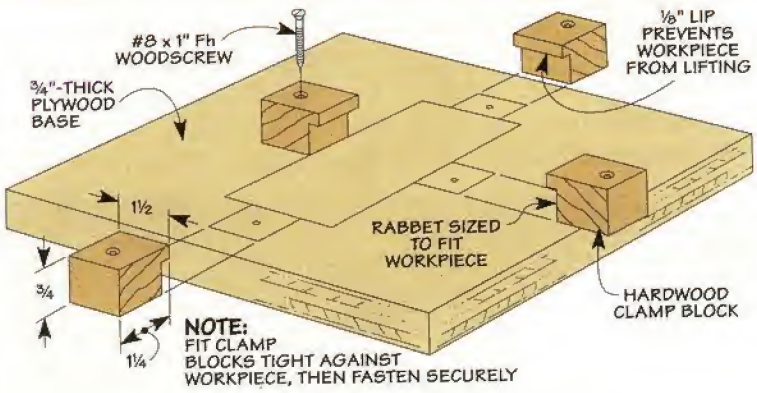
# Shop Short Cuts

**Safe Drilling.** *A simple jig holds the workpiece securely for safe, accurate drilling in aluminum.*

## Drilling Jig

Drilling the holes for the aluminum squares on page 36 presents a couple of problems. First, the drill bit can "grab" the workpiece and cause it to spin. Then when you raise the bit, it can lift the workpiece off the table. To solve those problems, I made the hold-down shown above.

The illustration shows a simple and effective design. There are four hardwood clamp blocks screwed to a plywood base. The blocks not only keep the aluminum blank from spinning, but they also have a lip that holds the blank down tight against the base. The large base makes it easy to secure the jig to your drill press table for safe and trouble-free drilling.



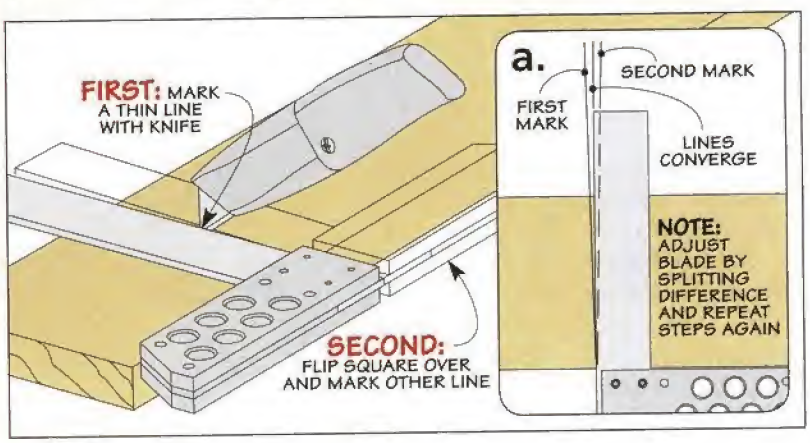

To make the clamp blocks, start with a long workpiece. I set my table saw up to cut a rabbet to form the lip, as you see above. Finally, you can cut the blocks free.

## Squaring the Blade

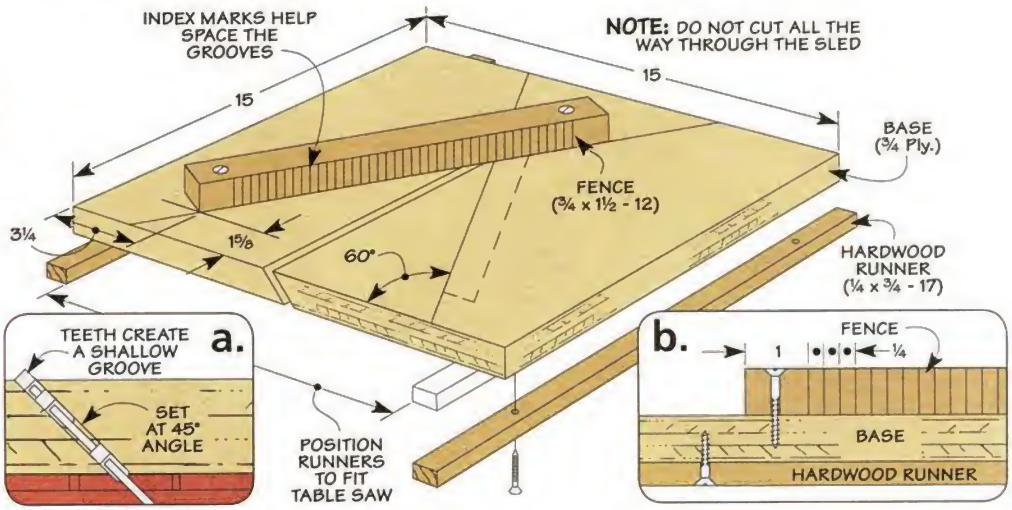
One of the challenges of making your own square is getting the blade exactly 90° to the handle. To get a good starting point, I use a squared-up piece of MDF, as shown below.

**Blade Adjustment.** *Use a squared-up piece of MDF as a starting point for adjusting the blade.*

Then, to test the accuracy and fine-tune the square, start with a straight, jointed workpiece. Place the handle of the square against the workpiece and mark a thin line along the blade with a knife (below). Now, flip the square over and mark another line. If your square is accurate, the two lines should match, or be parallel. If they aren't parallel, keep adjusting the blade and marking new lines until they converge into a single line, as shown in detail 'a.'



# Crosshatch Sled




The key to making the diamond cross-hatch pattern on the square on page 39 is this sled. It fits your table saw and holds the aluminum blank at a consistent angle to form the pattern. I use a rip blade so the corners of the saw teeth score the aluminum to form shallow grooves.

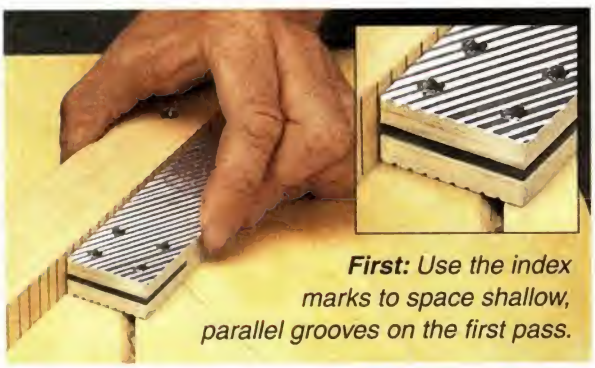
The first thing to do is start with the plywood base. It's just a square blank with hardwood runners to guide it. I first slid the runners into the miter slots on the saw. To position the runners, you can use the rip fence as a guide to lower the base in place. Finally, fasten the runners with a couple of screws.

Now you can work on the fence. It's a ¾"-thick strip of hardwood with index marks spaced every ¼" (drawing above). These marks are used to space the grooves that will eventually form the diamond pattern on the handle of the square.

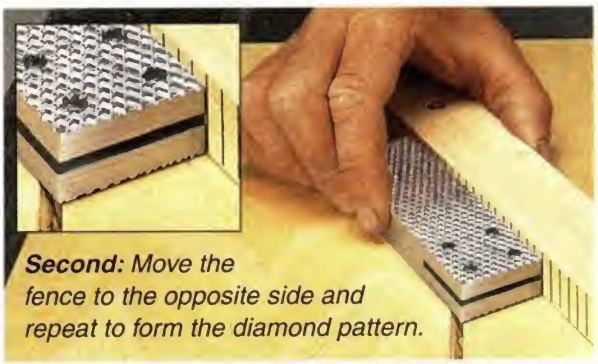
Before you can use the sled, you need to mark a couple of 60° reference lines and fasten the fence on one of these lines, as shown above.

There's one other adjustment to make. You need to tilt the blade 45° and raise it so that it's 1/16" above the top of the sled (detail 'a').

To make the pattern, hold the aluminum blank against the fence and align one end with an index mark, then make a pass over the blade. Repeat this process, moving the blank to the next mark with each pass. When you've made grooves on both faces, move the fence to the other side and repeat the process to finish the diamond pattern.



***First:** Use the index marks to space shallow, parallel grooves on the first pass.*

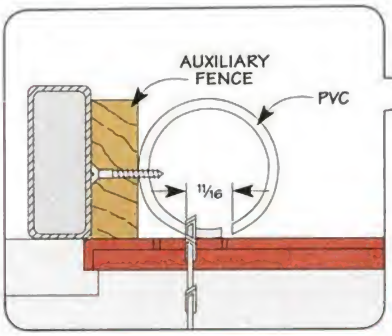


***Second:** Move the fence to the opposite side and repeat to form the diamond pattern.*

# Slotting PVC Pipe

When I was making the outfeed support for the planer stand on page 18, I ran into a little challenge. How do you cut a straight, accurate slot along the length of a section of PVC pipe? As you can see in the photo at right, the answer is really pretty simple and works great.

I used a piece of hardwood as a carrier for the pipe (drawing at right). A couple of screws hold the pipe secure and flat on the saw top. Then you can use the rip fence on your saw to guide the assembly. When you cut PVC pipe along its length, it'll have a tendency to spring closed. Aim for a snug fit over the vertical piece of the outfeed support on the planer stand.



***Slotted Pipe.** A simple carrier makes ripping this slot an easy and safe task.*

# mobile Planer Stand

## Make your shop workhorse even more productive with this handy project.

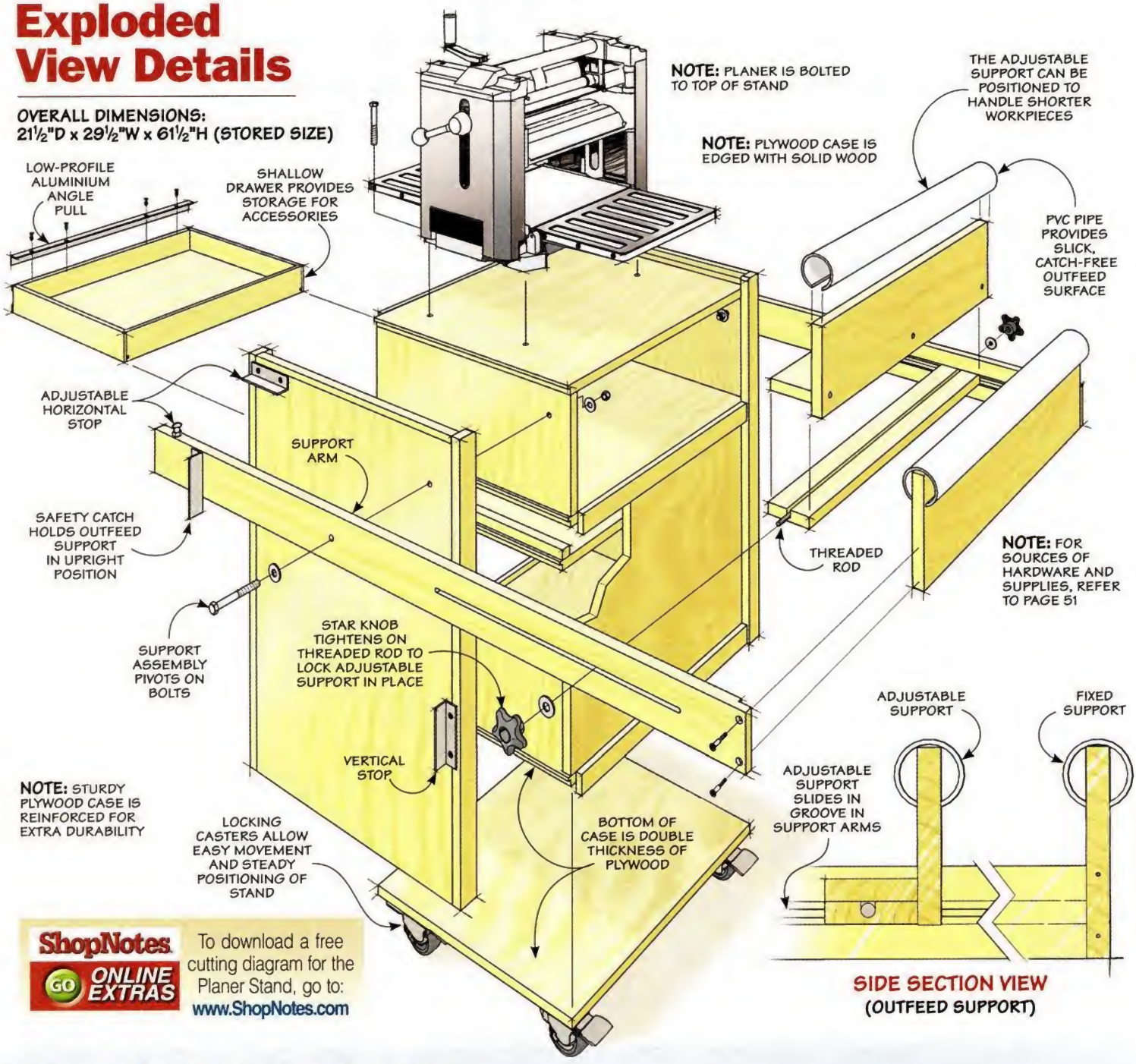
Pound for pound, a portable planer has to be one of the hardest-working machines in the shop. And when you combine your planer with the versatile stand shown above, for you, the work will get a lot easier.

This project starts with a rugged, plywood case that puts the planer at just the right working height. A drawer for accessories, a large open storage area, and a set of locking casters round out the case.

But the feature that really stands out is the built-in, adjustable outfeed support. The key is that it's only "out" when you need it. When the job is complete, the support swings up over the stand and locks in place for easy movement and compact storage (inset photo).

# Exploded View Details

**OVERALL DIMENSIONS:**
**21½"D x 29½"W x 61½"H (STORED SIZE)**




**ShopNotes GO ONLINE EXTRAS**

To download a free cutting diagram for the Planer Stand, go to: www.ShopNotes.com

## Materials & Hardware

| | | |
|---|---|---|
| **CASE** | | |
| A | Sides (2) | 20 x 30 - ¾ Ply. |
| B | Top/Upper Divider (2) | 20 x 24 - ¾ Ply. |
| C | Bot./Lower Divider (2) | 19¼ x 24 - ¾ Ply. |
| D | Back Panel (1) | 18½ x 23½ - ¾ Ply. |
| E | Side Filler Panels (2) | 20 x 8¾ - ¾ Ply. |
| F | Bottom Filler Panel (1) | 20 x 23½ - ¾ Ply. |
| G | Side Caps (2) | ½ x ¾ - 20 |
| H | Stiles (4) | ¾ x 1½ - 30½ |
| I | Narrow Edging (4) | ½ x ¾ - 22 |
| J | Wide Edging (3) | ½ x 1½ - 22 |
| **DRAWER** | | |
| K | Drawer Front (1) | ¾ x 2 13/16 - 21⅞ |
| L | Drawer Back (1) | ½ x 2 13/16 - 21⅞ |
| M | Drawer Sides (2) | ½ x 2 13/16 - 19¼ |
| N | Drawer Bottom (1) | 19 x 21⅜ - ¼ Ply. |
| O | Drawer Guides (2) | ¾ x 13/16 - 20 |
| **OUTFEED SUPPORT** | | |
| P | Support Arms (2) | ¾ x 3 - 48 |
| Q | Adj. Support Guide (1) | ¾ x 3 - 25½ |
| R | Adj. Support Guide Cover (1) | ¾ x 3 - 25 |
| S | Adj. Support Upright (1) | ¾ x 7 rgh. - 25 |
| T | Fixed Support Upright (1) | ¾ x 8 rgh. - 25½ |

- (5) 1" x 1" - 4" Aluminum Angle (⅛" Thick)
- (1) 1" x 1" - 21⅞" Aluminum Angle (⅛" Thick)
- (2) 1½" I.D. x 25" PVC Pipe
- (4) 3" Locking Swivel Casters
- (2) ¼" - 20 Star Knobs
- (2) ¼" Washers
- (1) ¼" x 28" Threaded Rod
- (2) ⅜" x 3" Hex Bolts
- (4) ⅜" Washers
- (2) ⅜" - 16 Lock Nuts
- (2) ¼" - 20 Threaded Inserts
- (2) ¼" - 20 x 1½" Rh Machine Screws
- (2) ¼" - 20 Hex Nuts
- (7) #8 x 1¼" Fh Woodscrews
- (12) #8 x ¾" Fh Woodscrews
- (16) #14 x 1" Lag Screws
- (16) ¼" Washers
- (2) #6 x ½" Rh Woodscrews

# a sturdy, plywood Case

Even a portable planer is a fairly heavy tool and the stand that it sits on may take a considerable amount of abuse. So I wanted to get off on the right foot by building a very sturdy case. I accomplished this with a combination of solid joinery and some "structural" reinforcement in a few critical spots.

**Sides and Dividers.** A look at Figure 1 shows you how the plywood case is put together. The top, bottom, and dividers are joined to the sides with a tongue and dado, as shown in Figure 1a. This joint gives you both good gluing strength and racking resistance.

The first step is to cut the two case sides to size. Next, each side needs four dadoes. Your only worry here is to match the position of the dadoes on both side pieces.

With the work on the sides complete, you can cut the top, bottom, and two dividers to size. The top and upper divider are identical. The bottom and lower divider are likewise identical, but ¾" narrower (front to back). This makes room for a plywood back panel you'll add later. After cutting snug-fitting tongues on the dividers, you can start assembling the case. Glue and clamps are all it takes.

**Reinforcement.** Next, I turned my attention to beefing up the case in a few spots. First, I added the ¾" plywood back panel (Figure 1b). This adds an extra level of racking resistance and also closes in the drawer opening and lower storage area. The back is sized to fit between the sides. It butts up to the upper divider and sits flush with the case bottom (Figure 1b).

Next, I strengthened the joints between the top and the sides by gluing a second layer of plywood

FIGURE 1

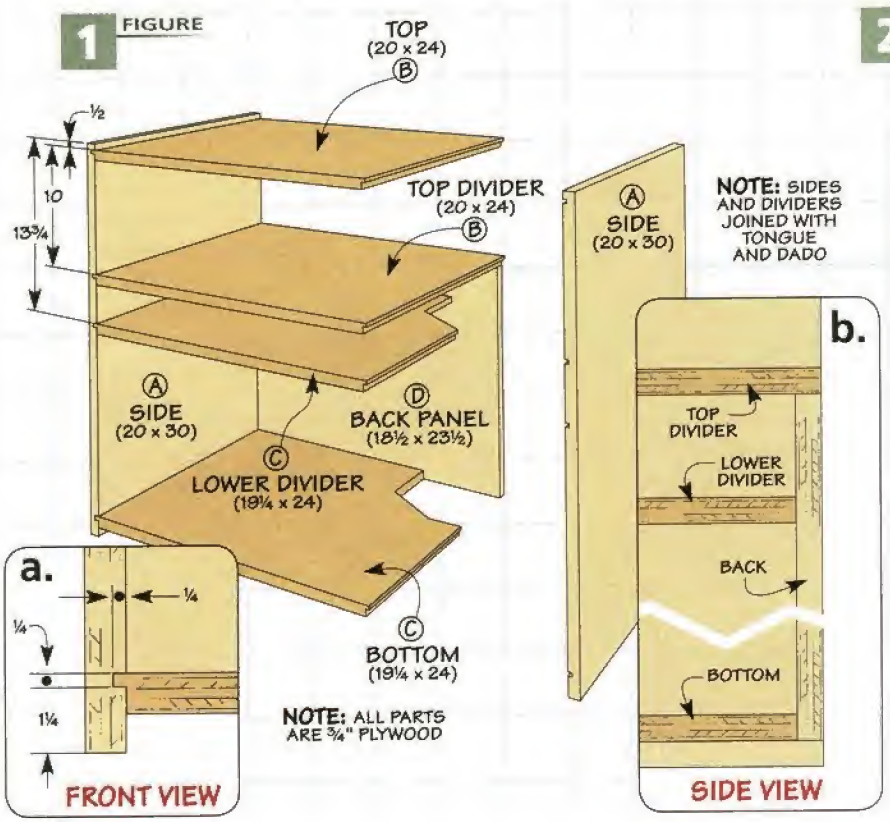
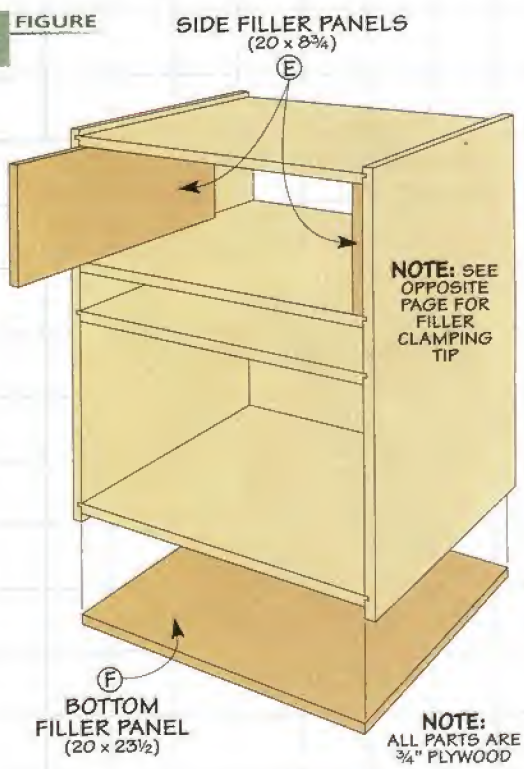
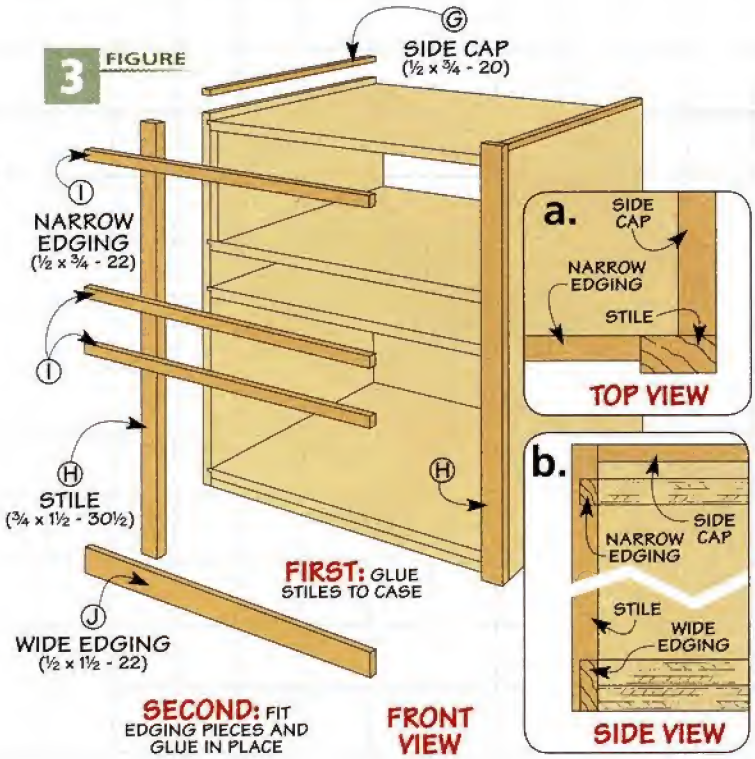
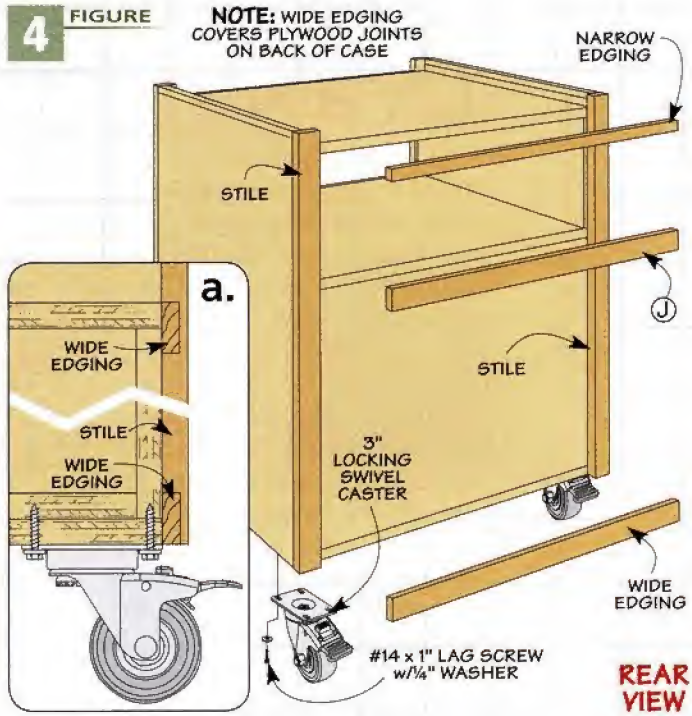



FIGURE 2






to the inside of the case, as shown in Figure 2. You'll find a handy clamping tip that will help you with this in the box below.

The final spot for reinforcement is the bottom of the case. Here again, I "doubled up" the plywood to create a very solid foundation for the casters (Figure 2). And I should note that this piece extends flush to the case back and sides.

## THE EDGING

At this point, you have a solid case, but it's a little unfinished on the outside. Some hardwood edging glued to the plywood case will give it a cleaner look and help it stand up to shop wear and tear.

A look at Figures 3 and 4 above shows what needs to be done. The edging I applied is a cross between simple edging and a face frame. The pieces are simply glued in place one at a time. The front and back of the case get a similar treatment, but the pieces are a bit different.

**The Pieces.** The first step is to glue a "cap" on the top edges of the sides and trim it flush. Next, I added side "stiles" cut from ¾"-thick stock. They should be flush at the top, bottom, and outside edges, as in Figures 3a and 3b.

With the stiles in place you can start adding the horizontal edging. These pieces are thinner — just ½" thick — and are simply cut to fit between the stiles. And here is where there's a minor difference between the front and back.

On the front of the case, all of these pieces are sized to fit flush with the surfaces of the plywood (a double thickness at the bottom). At the back, there are only three horizontal edging pieces. The two lower pieces are sized to conceal the joint between the dividers and the case back (Figure 4a).

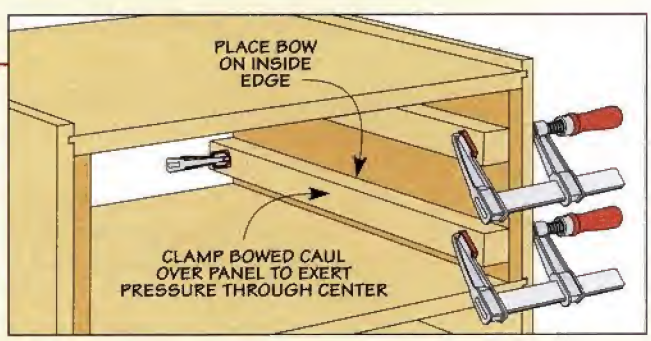
**The Casters.** Once all the edging was in place, I took the time to add the locking casters. This way, you can easily move the case while finishing the job. Just flip the case over and screw them to the bottom.

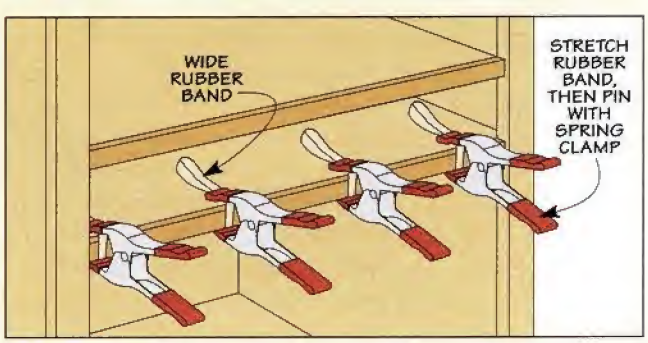
## Clamping Tips

The challenge I came up against when assembling the case was how to apply clamping pressure in places my clamps couldn't reach. Here are a couple of tricks I used to get the job done.

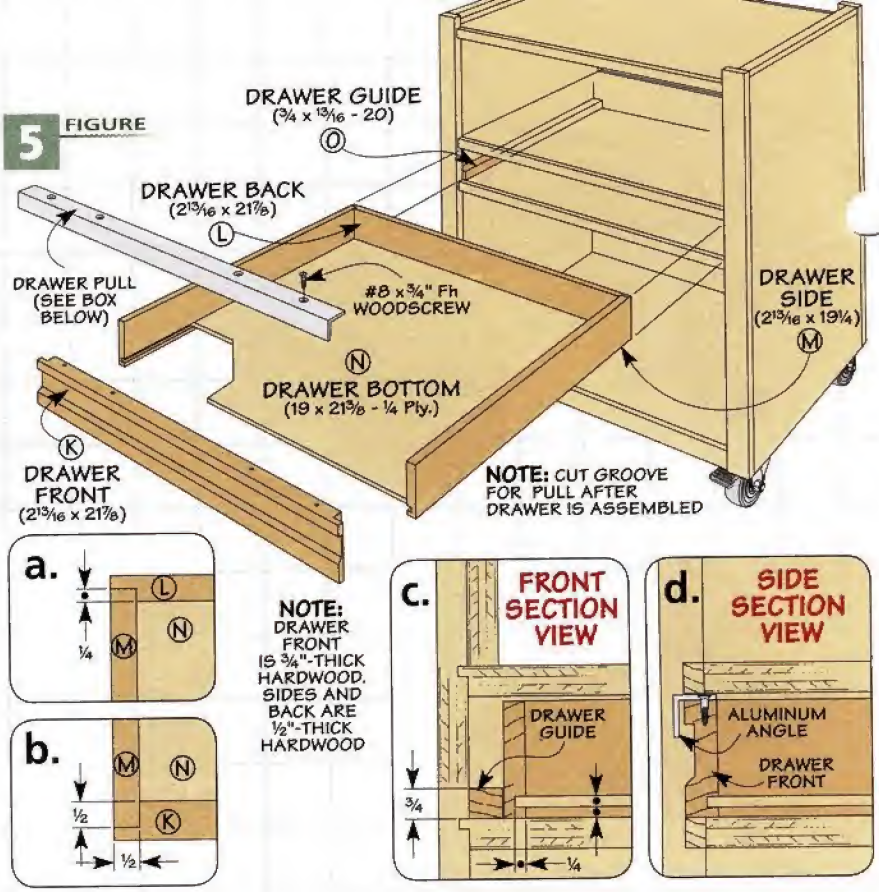
When gluing the filler panels into the case, I used heavy cauls with a slight bow planed on one edge. A clamp tightened at either end is all you need to apply pressure across the width of the panels (upper drawing).

The lower drawing shows how I teamed up heavy rubber bands and spring clamps to glue edging in place (lower drawing). Simply stretch the rubber band and pinch it with the clamp.



# adding a Drawer




There are a few items that you'll want to keep close by your planer — spare knives, set-up gauges, the owner's manual, and various adjustment tools. The shallow drawer in the center of the case is the perfect spot for these things.

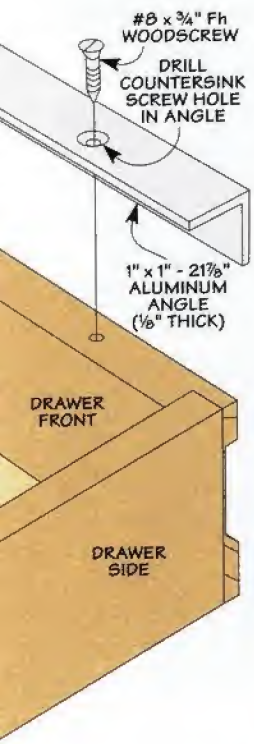
**Construction Basics.** As you can see in the drawings at right, I kept the drawer simple. It's sized to fit the opening in the case with 1⁄16" clearance on either side. And I left enough top-to-bottom clearance to accommodate the "top-mounted" pull. The drawer slides on the divider beneath it, and a pair of guides installed at the sides of the case keep it centered (Figure 5c).

The joinery is basic, but solid. The ends of the front and back are rabbeted to accept the sides. A groove in all four parts will hold the plywood bottom. Then you can glue everything together.

**A Low-Profile Pull.** Once the drawer is assembled, you can add its one unique feature — the pull. I wanted a drawer pull that would be easy to get a hold of, but also out of "harm's way." A length of aluminum angle was the answer. As you can see in Figure 5d, the combination of a groove cut into the drawer front and the overhanging flange of the angle makes an easy-to-grip, low-profile pull. The box below shows you how to make and fit the pull to the drawer front.

**Drawer Guides.** The final step is to add the drawer guides. These are cut to size and then glued in place. They should stick past the inside edges of the stiles a bit to keep the drawer centered in the opening.

## Making a Drawer Pull

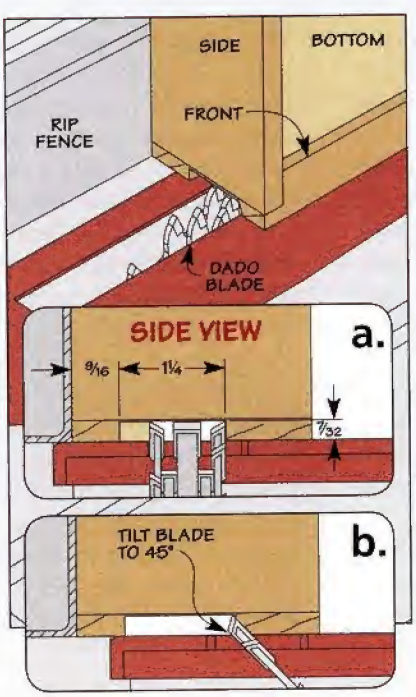



Creating the handy, low-profile pull from a length of aluminum angle is a pretty straightforward, three-step job. The drawings here take you through the process.

The first step is to create a shallow finger recess in the drawer front by cutting a wide groove along its length, as shown in detail 'a.' I used a dado blade on the table saw, followed by a little bit of sanding, to get this job done.

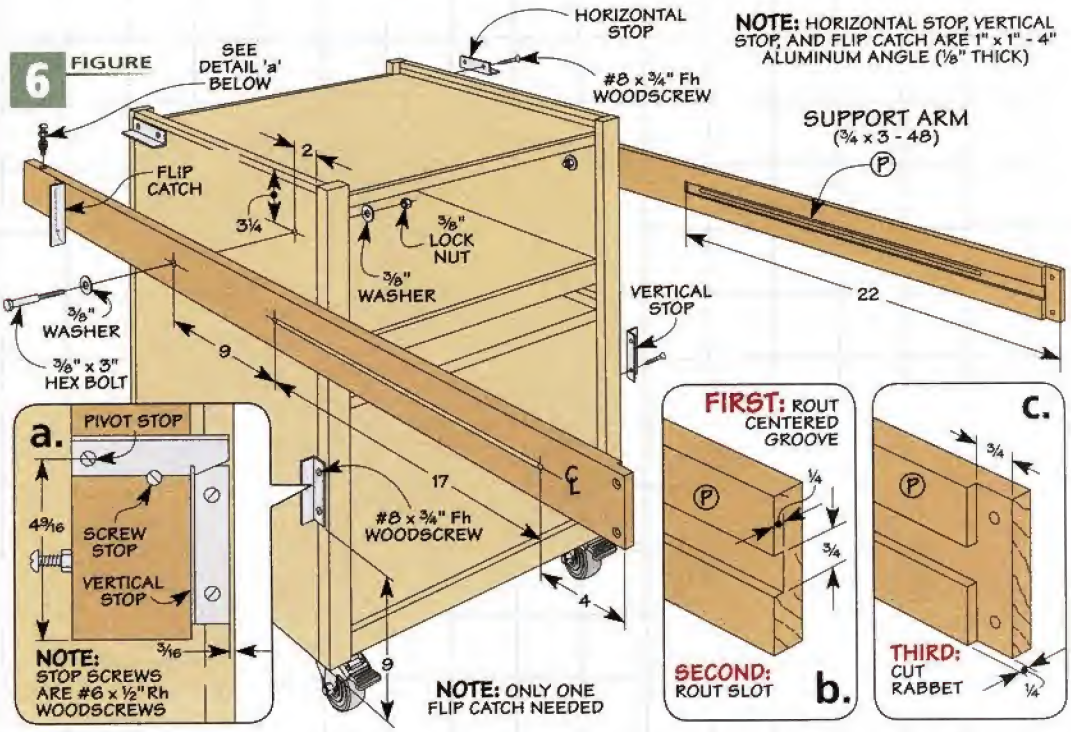
Next, I switched to a standard blade and tilted it to 45° to bevel the bottom edge of the groove (detail 'b').

Now, the aluminum angle can be cut to length and countersunk screw holes drilled in one flange (left drawing). Finally, you can screw the pull to the top of the drawer front with the upper flange flush to the inside edge.



▲ ***Low-Profile Pull.*** *A length of aluminum angle makes an easy-to-grip, low-profile drawer pull.*

# building the Outfeed Support




With the case complete, the next step is to start work on the pivoting, adjustable outfeed support.

**Overview.** First, let's take a quick look at the overall assembly. The outfeed support starts with two long arms that pivot on bolts fastened at the back edge of the case. The arms carry two support assemblies — one fixed at the end of the arms for long stock and a second, adjustable support for shorter pieces. Two different sets of stops hold the assembly in the either the horizontal or the vertical position.

**Support Arms.** The work starts by making and installing the supports arms and the stops, as shown in Figure 6. Then on the following pages you'll see how the two supports are built and installed.

First, I cut the two arms to size from ¾"-thick stock. Then I took them to the router table and routed a stopped groove partway along the inside face of each piece (Figure 6b). This groove will hold the adjustable support assembly.

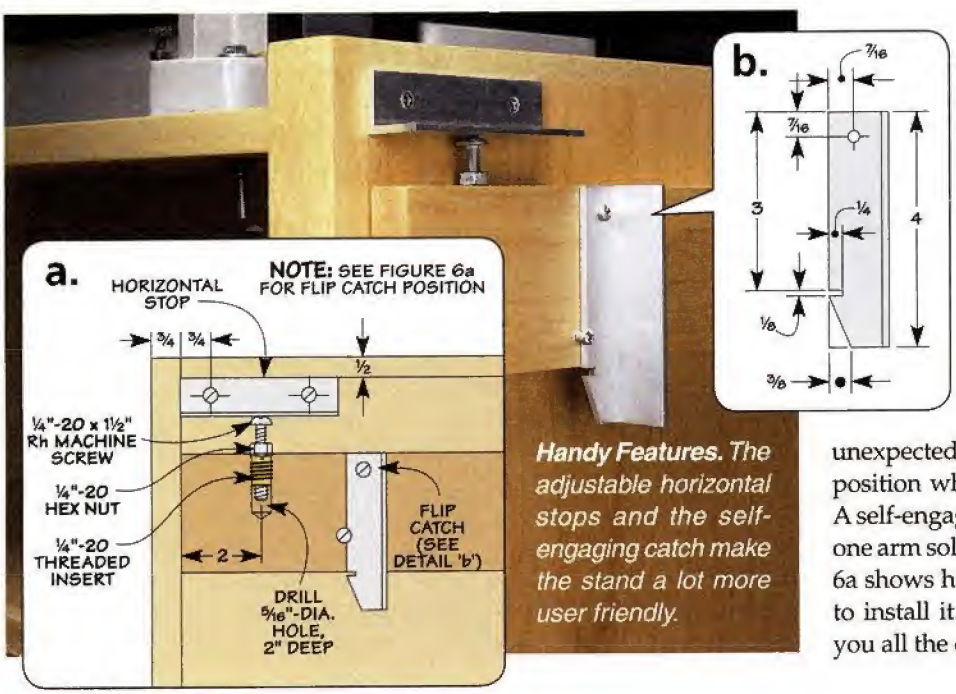
Next, to accommodate the locking mechanism of the adjustable support, I routed a ¼"-wide slot down the center of the groove (Figure 6). I just drilled a starter hole at each end of the slot and then routed between them.

As you can see above, the fixed support is held in rabbets cut into the ends of the arms. Cutting these rabbets and drilling pilot holes for the screws used to attach the arms completes the work on the "outboard" ends (Figure 6c).

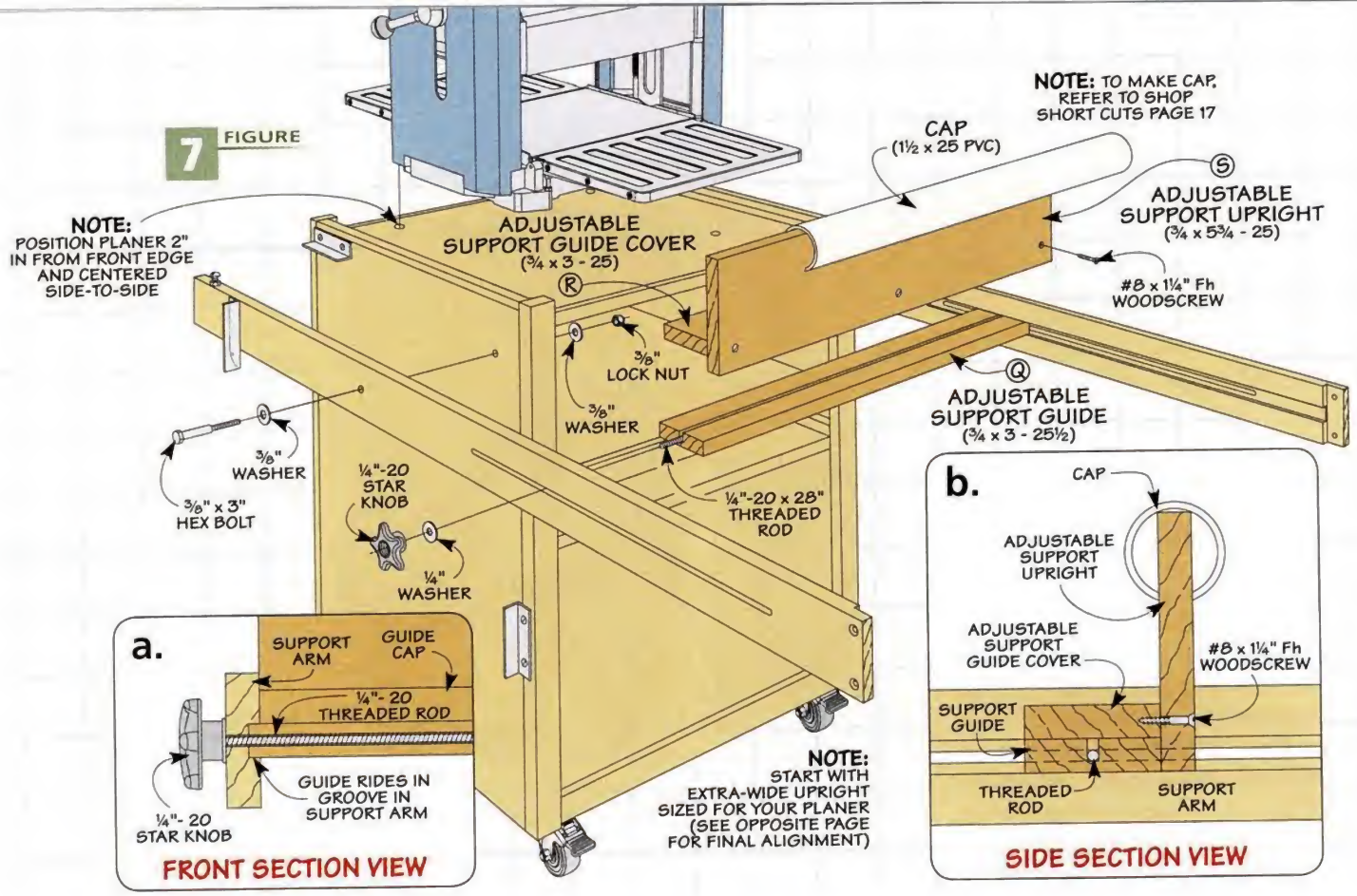
**The Stops.** Before mounting the arms, you'll want to install both sets of stops. The vertical stops are simply sections of aluminum angle screwed to the back edge of the case, as shown in Figure 6a.

The details for the adjustable horizontal stop assemblies are shown in the photo and detail 'a' below. In a nutshell, the head of a bolt threaded into an insert in the arm butts up to a piece of aluminum angle screwed to the case. By turning the bolt in or out, you can adjust the height of the supports on the opposite end of the arms. It's simple, but effective.

**Mount the Arms.** With the two stops installed, you can bolt the arms to the case, as shown in Figure 6. And finally, I wanted to make sure the outfeed support assembly didn't unexpectedly fall from its upright position when I moved the stand. A self-engaging flip catch added to one arm solves the problem. Figure 6a shows how it works and where to install it. Detail 'b' at left gives you all the dimensions you need.




*Handy Features. The adjustable horizontal stops and the self-engaging catch make the stand a lot more user friendly.*




With the support arms installed, you can start on the business end of the assembly — the two supports. This is pretty straightforward, but one thing needs explanation.

**Straight and Level.** The real key to getting the most from the outfeed supports is to install them perfectly level with the planer bed. Having solid outfeed support at the right height gives you two important benefits. First, by supporting a workpiece as it exits the planer, you eliminate a lot of the running back and forth from the infeed to the outfeed side. Second, it helps prevent the troublesome problem of snipe by supporting the workpiece perfectly level with the planer bed through the entire cut.

So you want the supports positioned at just the right height, but the question is, how do you size them to achieve this? The easy answer is to first make the supports to rough height and then custom fit them to your planer sitting on the stand. The box at the bottom of the following page shows how to do this. At this point, to get a ballpark figure for the supports, you need to set your planer on the stand and bolt it down, as shown above.

**The Adjustable Support.** With this done, you can now get to work. The adjustable support is more involved so I started there.

If you take a look at Figures 7 and 7b above, you'll see how the adjustable support is built. It's made up of three pieces cut from ¾"-thick hardwood and a cap made from a section of PVC pipe.

The base of the support is a guide piece that rides in the grooves in the support arms. The key here is to size this piece so that it slides easily in the grooves.

Down the center of the guide, I cut a groove to hold a length of threaded rod. The rod (glued in place with epoxy) will extend through the slots in the support arms. This allows you to tighten a star knob at either end and lock the support in position (photo at left).

On top of the guide piece, I glued a shorter guide cover. It's sized to fit between the support arms and its main purpose is to help keep the support aligned squarely between the two arms. A look at Figure 7a will give you the idea here.

The third piece is an upright that's screwed at right angles to the guide assembly. For now, you can cut this piece to length, but leave it extra wide for final fitting and don't fasten it in place.

**The Fixed Support.** Before working on the PVC pipe cap for

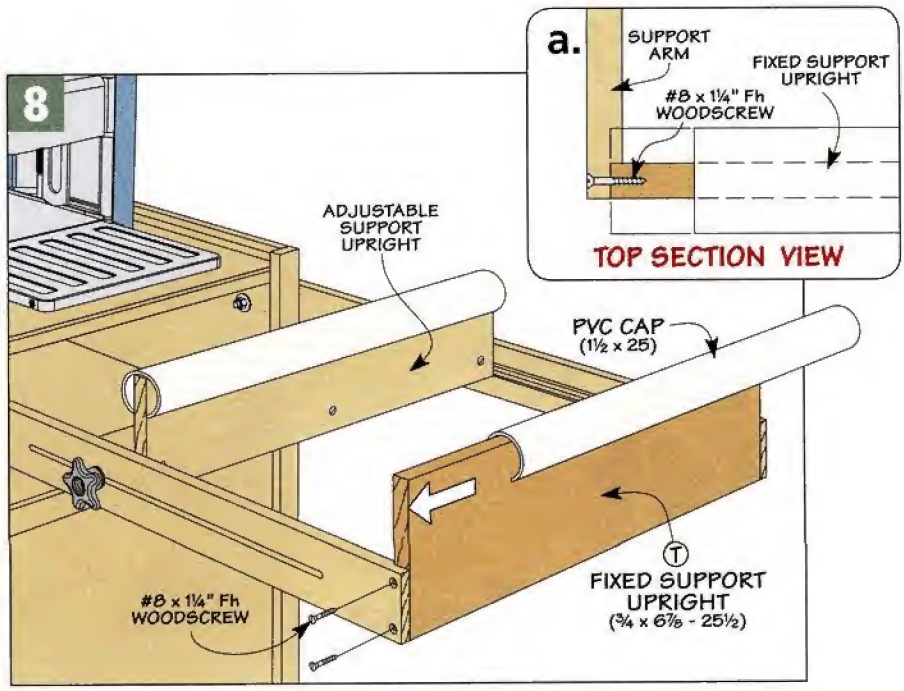
◀ ***Locking Mechanism.*** *The adjustable support is quickly locked in place by tightening a star knob.*

the adjustable support, I made the fixed support upright. It's simply cut to fit between the rabbets in the support arms. Again, you'll want to cut it extra wide and don't screw it to the arms just yet (Figure 8).

**A Smooth-Sliding Cap.** Now you can make and add caps to the uprights in preparation for the final fit and assembly. Here, I wanted the bearing surface of the supports to be pretty friction-free and also "catch-free." The smooth surface and round shape of some 1½" I.D. PVC pipe is the perfect solution.

To fit the caps over the uprights, I had to cut an accurately sized slot down the length of each pipe section. The key here is to size the slot so that the cap snugly pinches the upright and stays put, as in Figures 7b and 8. You'll find the technique I used to do this on page 17.

**A Custom Fit.** With caps added to the two uprights, the final step is to custom fit and install the supports on the support assembly. The technique I used to get them perfectly aligned with the planer bed is shown in box below.



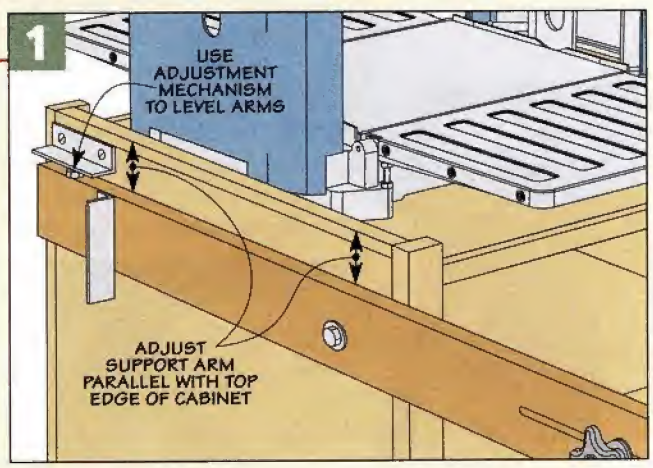

And once the two uprights are screwed in place, you're in business. All you need to do now is come up with a project to put your hard-working planer to use.

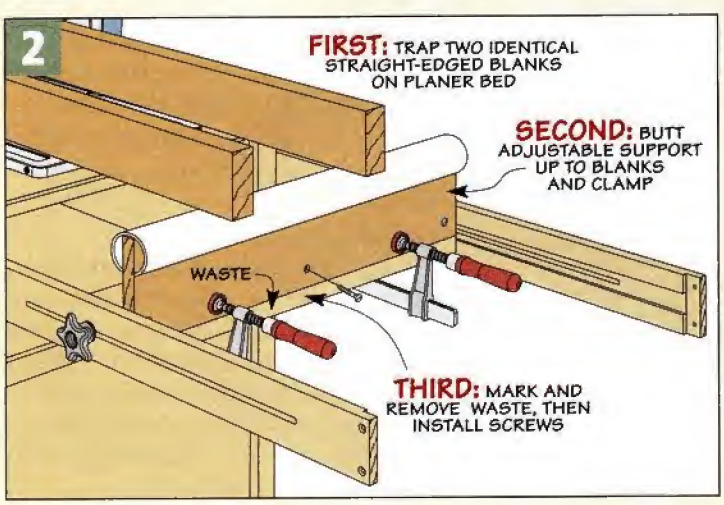
## Aligning the Supports

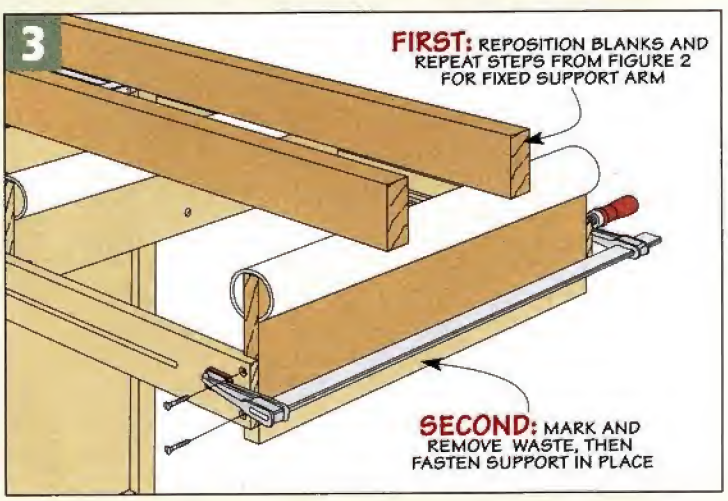
Installing the two supports so that they were perfectly aligned with the bed of the planer turned out to be a lot easier than I thought. As I mentioned before, the trick is to cut the pieces extra-wide and then custom fit them to the support assembly using the planer bed for reference. The drawings show the simple steps involved.

The first step, shown in Figure 1, is to "zero out" the two support arms by aligning them parallel to top of the stand (and planer bed).

Now, you can align the adjustable support to the planer bed with the help of a pair of straight-edged blanks, as shown in Figure 2. After marking and trimming the waste from the upright, clamp it back in place and install the screws. Then reposition the blanks and follow the same procedure for the fixed support (Figure 3).



# using a Random Orbit Sander

## Get better sanding results with a few simple tips.

Sanding isn't a glamorous task, but doing it right makes all the difference in the finished project. And, in my shop, the top tool to get the job done is a random orbit sander. Here are a few techniques I've learned over the years for getting the best results with one.

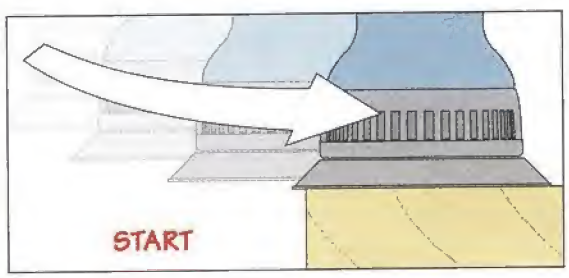
▲ ***Clean It Up.*** *As you smooth the workpiece with a series of grits (left), keep the sanding pad clear of dust, chips and debris (top photo).*

**Check the Sanding Pad.** Getting a smooth, even finish starts with the sanding pad (photo at lower left). First, it should be flat from edge to edge. As the pad wears, the edges often round up. And second, there should be no dust or debris between the sandpaper and the pad (photo at left). Both of these make it almost impossible to get a smooth surface on a workpiece.

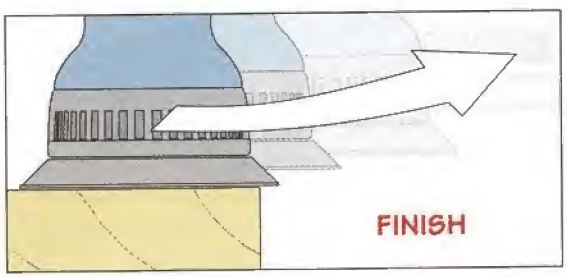
But even with a flat, clean pad, you can't just set the tool down and race it around the surface of the workpiece. Setting the sander down and turning it on can leave some troublesome scratches that'll just take more work to sand away.

### SANDING TECHNIQUES

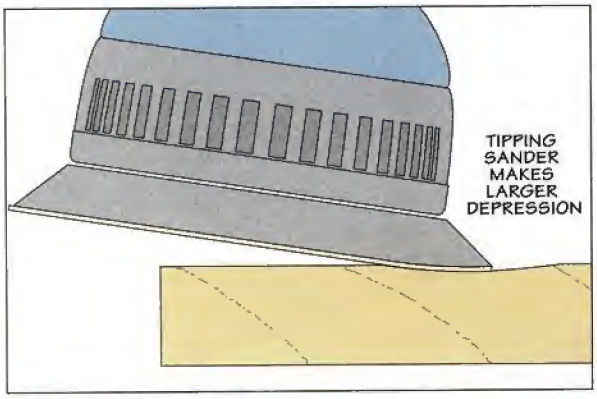
I like to use a few simple techniques when I'm sanding with a random orbit sander. The first is to "land" the sander onto the surface in a smooth, sweeping motion, like you see in the top drawing below. To do



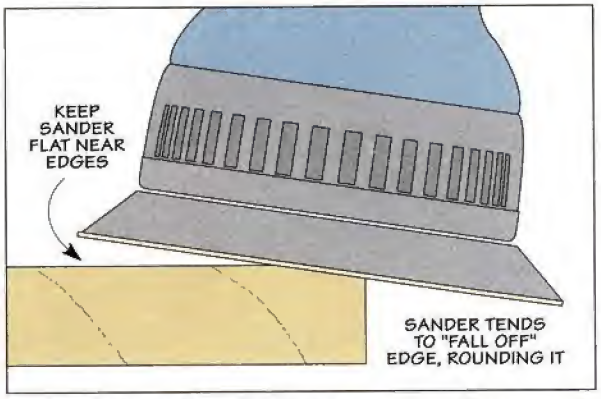

◀ ***Sweep In.*** *Lower the sander in a sweeping motion to reduce scratches at the starting point.*




◀ ***Sweep Away.*** *When you're finished, lift the sander off the workpiece in an identical sweeping motion.*




▲ ***Keep the Sander Flat.*** *Trying to eliminate a gouge in the surface by using the edge of the sanding pad makes the depression larger and more obvious.*




▲ ***Avoid the Edge.*** *Keeping the sander flat is crucial as it nears the edge of the workpiece to prevent rounding over the edge.*

this, I hold the sander just off the surface and turn it on. Before the pad reaches full speed, gently sweep the sander onto the workpiece. When you're finished, simply sweep the sander off the workpiece (bottom drawing on opposite page).

**Sanding Procedure.** Now that you have an idea of the mechanics of getting the sander to the workpiece, there's a step-by-step process that makes the rest of the job go quicker. First of all, because of the spinning action of a random orbit sander, the direction you sand isn't all that critical.

Still, I like to start by working across the grain with coarse sandpaper (80-100 grit). This technique removes material quickly and helps level the surface.

Next, switch to a finer grit (120-150) and sand with the grain. This removes the heavy coarse-grit scratches and gets you well on your way to a smooth surface.

The third step is to sand with the grain using 180- or 220-grit sandpaper. And finally, if there are visible scratches after all this, a little hand-sanding does the trick.

**Clean the Surface.** That's really all there is to it. But there are a few other tips to get top-notch results. One important tip is to wipe the surface down between grits (photo at right). The goal here is to remove any coarse grit and debris left behind from the previous step. If you don't, it can cause deeper scratches when you move to the next grit.

**Light Pressure.** As you sand, it's tempting to help the sander along by pressing down hard to get the job done more quickly. But there's a problem with doing that.

The extra pressure slows the sander's pad down, reducing its ability to overlap swirl marks and minimize scratches. Plus, the pressure may cause the sander's motor to overheat, shortening its life.

**Keep It Level.** Another temptation to avoid is tipping the sander up on edge to "rub out" a large scratch in the surface (left drawing above). While this may remove the mark, it's likely to create a larger, more noticeable depression.

**Slow Down.** Finally, let the sander do the work. The slower you move the sander, the less visible the scratches become.

▲ ***Keep It Clean.*** *Wiping the workpiece with a tack cloth ensures all dust and grit are removed.*

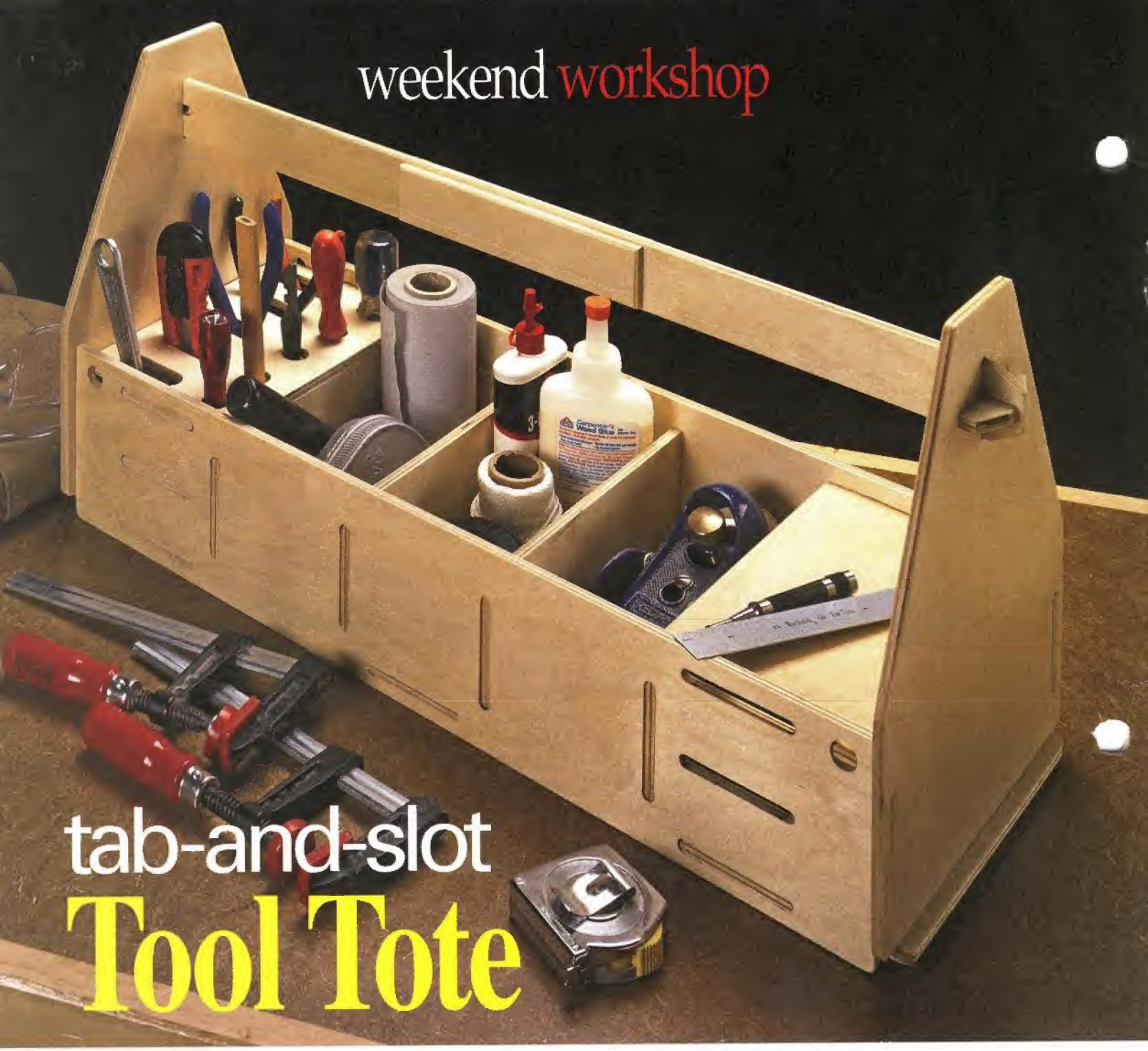
The ideal speed is about 1" of surface per second. This pace provides more control as well, so you're less likely to sand through a thin veneer or round over an edge, like you see in the right drawing above. (The box below shows another method to prevent rounding over edges.)

By following these simple tips, you'll get a smooth, flat surface in a shorter time. And as a result, a better-looking project.

## Preventing Roundovers

SHOP TIP

Keeping an edge crisp and square while sanding is a challenge. One good way to avoid rounding over an edge is to provide support for the sander as you work. As you can see below, a backer board the same thickness as the workpiece provides the necessary support.



# tab-and-slot Tool Tote

## Here's a handy carry-all for organizing tools. And it goes together without glue or fasteners.

This tool tote reminds me of the interlocking cardboard or sheet metal toys I had as a kid — the kind where you assembled them by "inserting tab A into slot B." Unlike those toys, this tote isn't some flimsy box. Once all the parts are together, they interlock to form a rigid, sturdy assembly.

What makes this even more amazing is the tote isn't glued and you don't need any hardware or fasteners to build it.

**Customized for You.** Besides the easy assembly, you can customize the dividers and tool holders to suit your needs. In fact, if you're like me, you might make two or three of these easy-to-build totes for specific tasks like hanging pictures, doing household repairs, or organizing craft supplies.

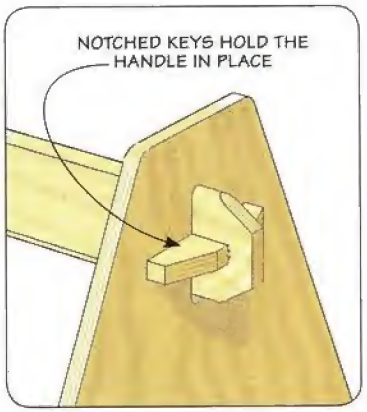
And if you want to change the layout of the tote later on? No problem. The tote comes apart just as easily and quickly as it went together in the first place.

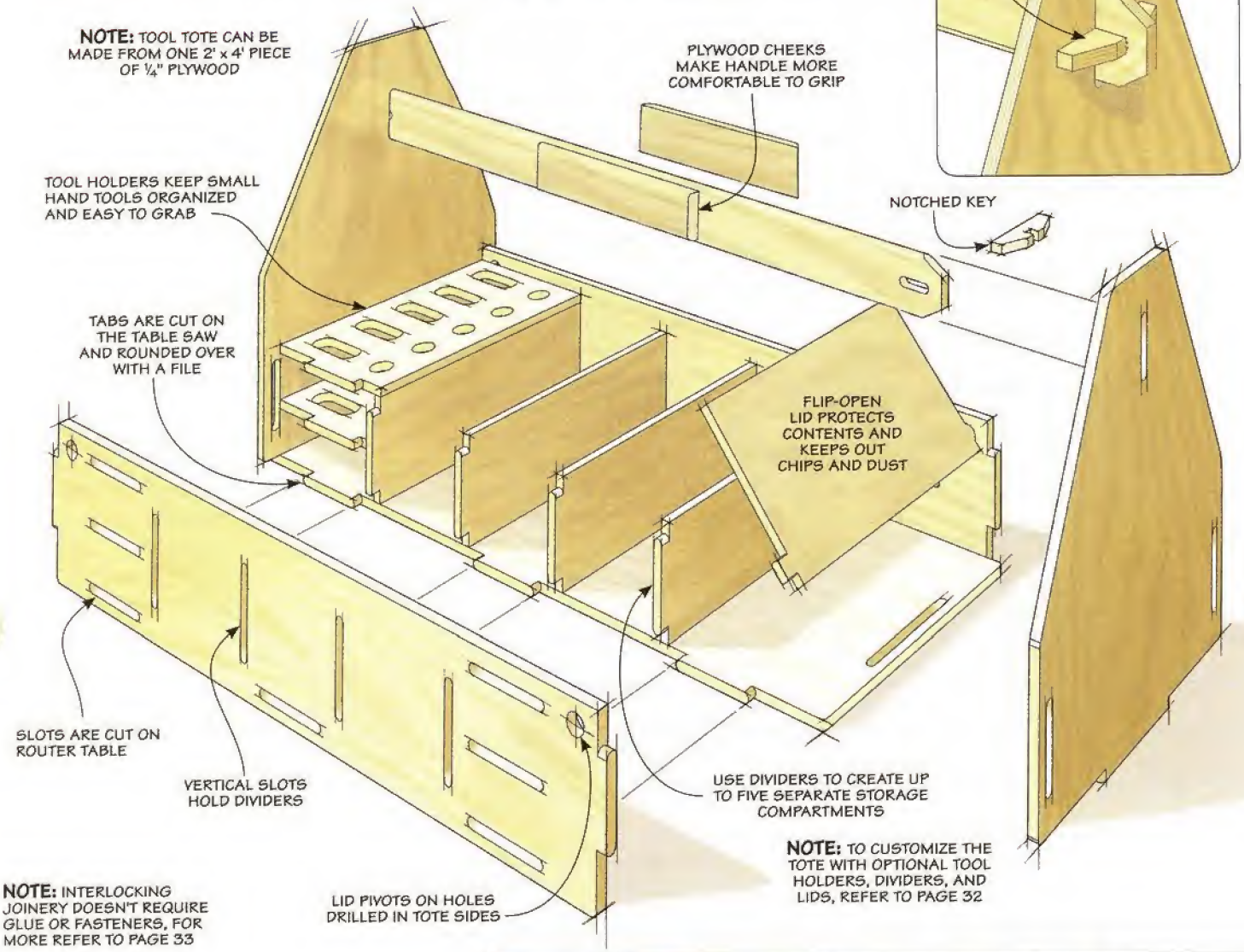
ShopNotes GO ONLINE EXTRAS

To download a free cutting diagram for the Tool Tote, go to: www.ShopNotes.com

# Exploded View Details

**OVERALL DIMENSIONS:**
21¾"W x 10¼"H x 8"D



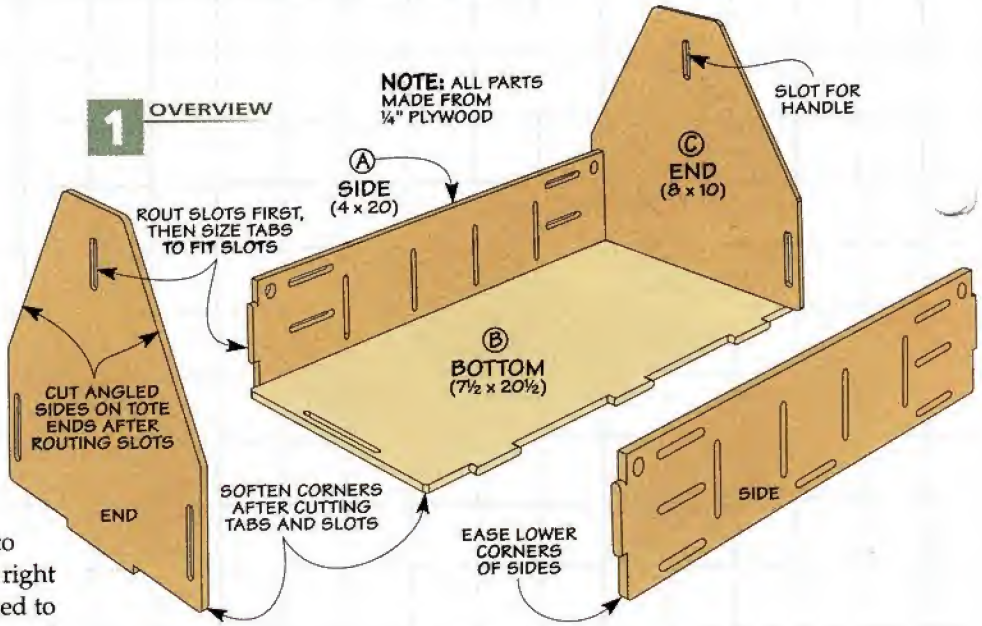




## Materials

| | | |
|---|---|---|
| A | Sides (2) | 4 x 20 - ¼ Ply. |
| B | Bottom (1) | 7½ x 20½ - ¼ Ply. |
| C | Ends (2) | 8 x 10 - ¼ Ply. |
| D | Dividers (2) | 2⅞ x 7½ - ¼ Ply. |
| E | Tool Holder Bottom (1) | 4¼ x 7½ - ¼ Ply. |
| F | Tool Holder Top (1) | 4½ x 7½ - ¼ Ply. |
| G | Lid (1) | 4⅜ x 7½ - ¼ Ply. |
| H | Handle (1) | 1½ x 21¾ - ¼ Ply. |
| I | Handle Cheeks (2) | 1¼ x 6 - ¼ Ply. |
| J | Keys (2) | ⅝ x 2¼ - ¼ Ply. |

***No Tools Needed.*** *Leave your glue and screws on the shelf. You can assemble this sturdy tool tote from a stack of parts in just a few minutes.*

# build the Box

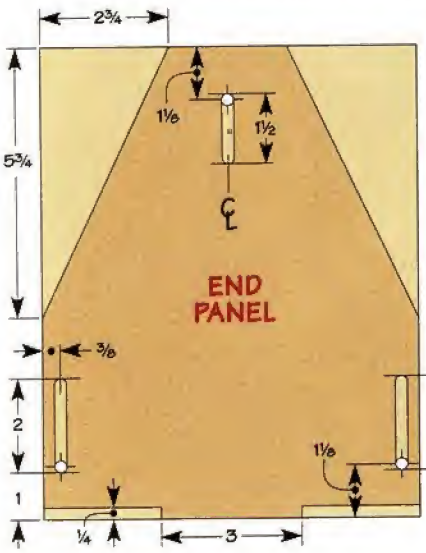


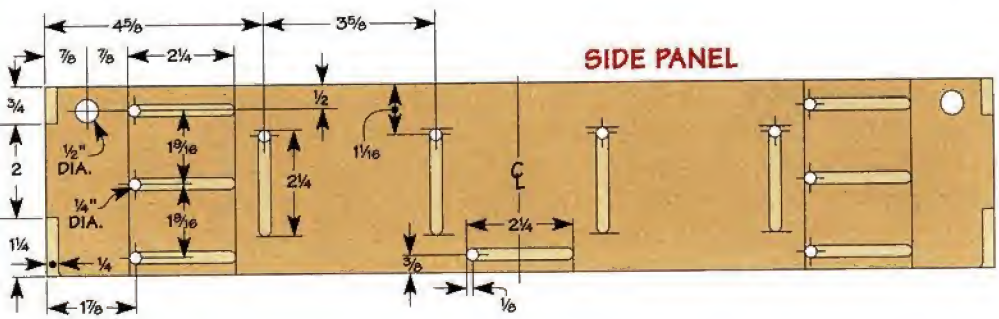

Part of the appeal in making this tool tote is that it doesn't take much material. All the parts can be cut from one 2' x 4' piece of ¼" plywood. (Hardboard would work, too.)

**The Right Plywood.** There's one thing I want to mention about the plywood right from the start. The joinery used to connect the parts is sized around standard ¼" bits. So you want to find a piece of plywood that comes as close to this size as possible. (I used ¼" Baltic birch.) That will give you snug-fitting joints and, as a result, a stronger final assembly.

The drawing above provides the sizes of the main parts of the tote and shows how they fit together. The first order of business is to cut the parts to size. And, in the case of the ends, it's best to leave them square for now. You'll use the edges as references for cutting the slots. (You can cut the angled sides after completing the joinery.)

Once all the parts of the box have been cut to size, you can get started on the tab-and-slot joinery. The joint works just like it sounds.

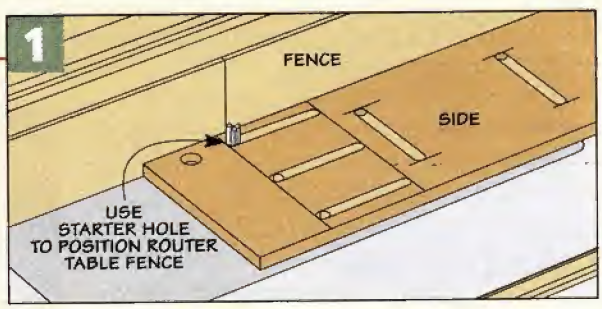


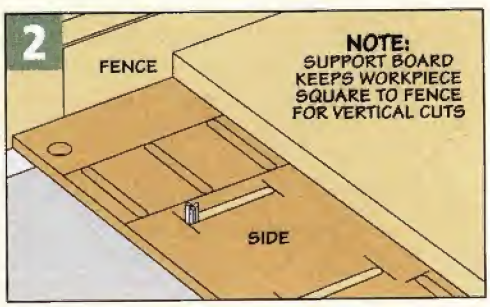

## Routing the Slots

After drilling the starter holes, the slots are finished up at the router table. Besides offering an entry point for the router bit, the starter holes serve another important purpose. You can use them as guides to position the fence (Figure 1).

To rout the slots, turn on the router and lower the workpiece over the bit (photo below). For the middle slots in the tote sides, you'll want to use a large support board to keep the workpiece square to the fence, as you can see in Figure 2.



◀ ***Set the Fence, Then Rout.*** *The starter hole works as a set-up gauge for the router table fence. Then you can lower the piece over the bit to rout the slot.*



Tabs cut in one part of the workpiece fit into slots cut in the other. The key here is accurate layout and working in the right order.

**Slots First.** Just like cutting a mortise first and fitting the tenon to it, I like to start with the slots. The reason is I find it easier to size and tweak the tabs to fit the slots.

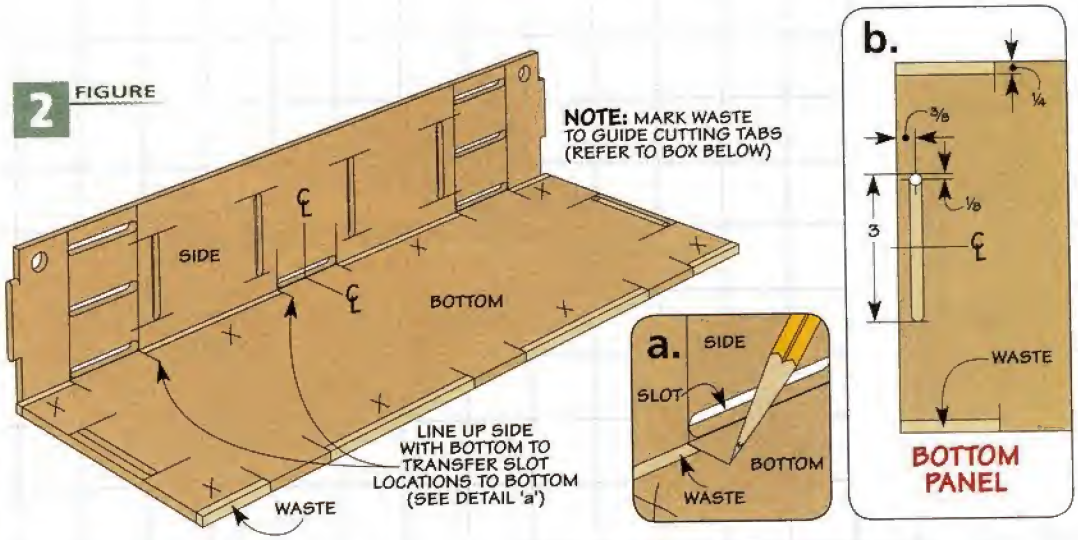
So the first thing to do is to lay out the slots in the bottom, sides, and ends of the tool tote. You'll find all the dimensions you need for this in Figure 2b and the drawings on the previous page. Besides cutting slots for joining the tote parts, you'll cut additional slots for the dividers that you'll make later.

**Making the Slots.** The actual cutting of the slots is a simple, two-step process — drill a starter hole, and then remove the waste.

The first step is done at the drill press. All you'll need is a ¼" bit to drill out a starter hole at one end of each slot. But before stepping away from the drill press, switch to a ½" bit and drill holes in the tote sides for the hinge tabs. (You'll use these later when installing the lids.)

The second step takes place over at the router table, as shown in the box on the bottom of the opposite page. For this, I installed a ¼" straight bit and set the fence using the starter holes as a set-up gauge.

FIGURE 2




Making the slots is as easy as turning on the router, and lowering the starter hole over the bit. Then rout until you reach the layout line.

There's something else I want to mention before moving on. When it comes to routing the vertical slots in the sides and the end slots in the tote bottom, you should use a large support board to keep the workpiece square to the fence, as shown in the box on the opposite page.

**Marking the Tabs.** The other half of the joint is the matching tab. The important thing here is making sure the tabs line up with the slots. To make things simpler, I marked the location of each tab by lining up the piece with the matching slot and marking it directly on the tab workpiece, as shown in Figure 2a.

After marking out the tabs, you can cut them out at the table saw, as shown in the box below.

**Round the Tabs.** This leaves you with a square tab and a slot with round ends. To get them to match each other, I used a file to round over the ends (photo below). Check the fit often to end up with a joint that slips together easily.

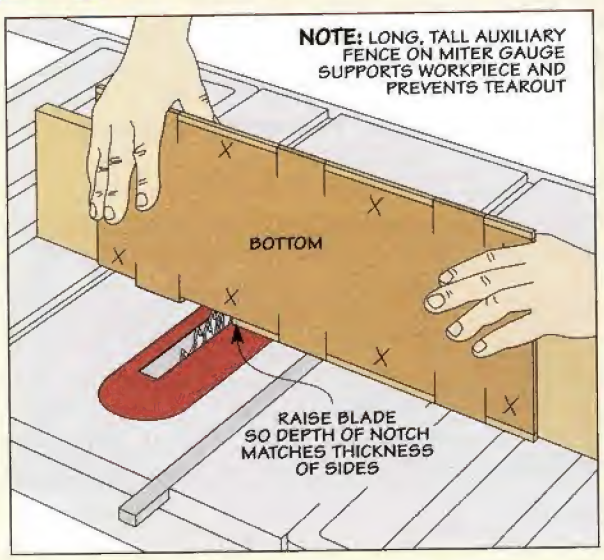
There are just a few things left to wrap up on the tote. The first of these is to cut the ends to shape. Then you can soften the corners of the ends, bottom, and sides.

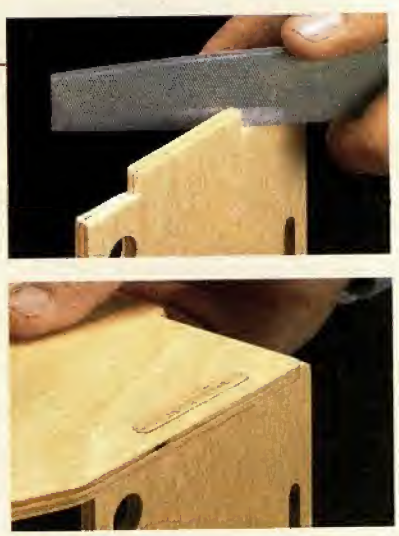
At this point, the parts for the tool tote box are complete. But you still need to make the handle and decide how to organize the inside of the tote before you can put anything together.

## Cutting and Shaping the Tabs

Cutting the tabs to fit the slots is a simple, two-step procedure. After laying out the position of the slots on the workpiece, you can remove most of the waste at the table saw with a dado blade. I attached a long, tall auxiliary fence to my miter gauge to support the workpiece and prevent tearout.

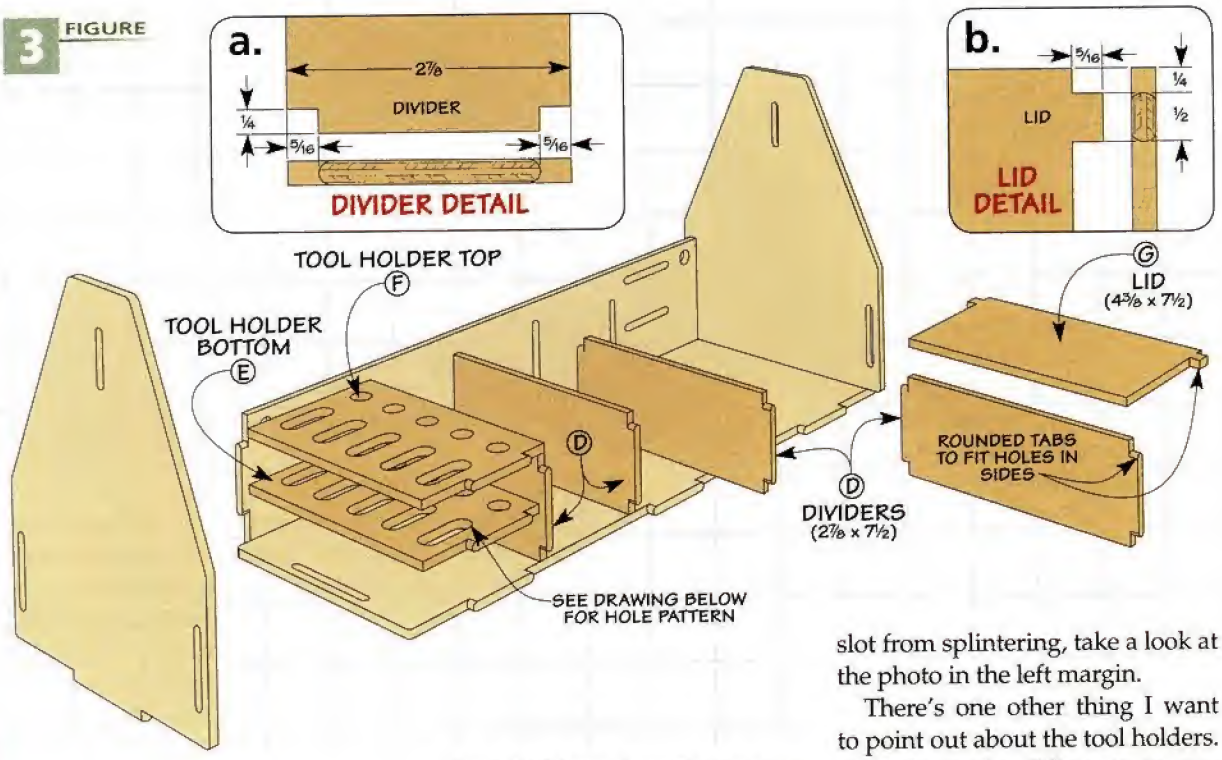
Cutting the tabs on the table saw leaves the ends square. To get them to fit the rounded slots, you'll need to file the tabs to fit, as shown in the upper photo at right. Check the fit of the tab often to get a gap-free joint that doesn't take a lot of effort to slip into the slot (lower photo).



▲ ***File to Fit.*** *To get the tabs to fit the slots, I used a file to round over the ends. Aim for a slip fit.*

FIGURE 3



▲ ***Clean Cut.*** *Score the edges of the slots to prevent tearout when cutting away the waste.*

# tool organizers & Handle

All that's left to do on the tool tote is add some organization and make the handle. I'll start with the organizers. And here's where you'll put those extra slots to use. In the drawing above, you can see one of the possibilities. Feel free to mix and match parts to suit your needs.

**Simple Dividers.** To start with, I made a few dividers. Making these is pretty straightforward. I just cut them to size and then marked the tab position based on the vertical slots in the sides. The tabs can then be cut the same way as before.

**Tool Holders.** The dividers are fine for adding some basic organization. But when it comes to holding small tools like screwdrivers, wrenches, and pliers, I wanted a way to organize them and make them easy to grab. So I made a pair of tool holders, as shown in the drawing below.

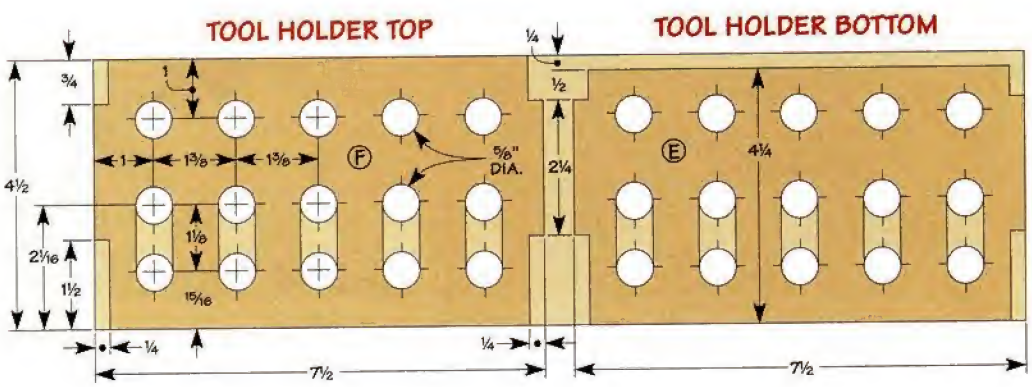
These holders are installed horizontally in the tote and have a series of holes and short slots to hold a wide range of tools. You already know how to make the tabs, so I won't go into that again. And the row of holes are simply drilled. But I cut the slots a little differently.

To make these, I drilled a hole at each end of the slot and then cut away the waste with a jig saw. To see how to keep the edges of the slot from splintering, take a look at the photo in the left margin.

There's one other thing I want to point out about the tool holders. And that's the difference in size between the two. The bottom holder is ¼" narrower so that it can fit between the end of the tool tote and the divider, as in Figure 3.

**Flip-Top Lid.** Another way to customize the tote is by adding a lid or two over the end compartments. This provides a protected storage space to keep out chips and debris. Tabs on the lid pivot in the ½"-dia. holes you drilled in the tote sides earlier (Figures 3 and 3b).

The short tabs that fit inside the holes are a little trickier to cut than the others. So for these, I marked the position of the tabs on the workpieces and cut them out at the band saw. If you stay to the waste side of the line, you can sand the edges smooth with no trouble. Again, a few swipes with a file will round the edges of the tabs for an easy fit in the holes.




## THE HANDLE

The final parts of the tool tote to make are the handle and keys that hold it in place. Once the handle is "keyed," it locks the whole tote together, as illustrated in Figure 4.

The drawing shows the handle is just a simple strip of plywood. A short slot at each end of the handle

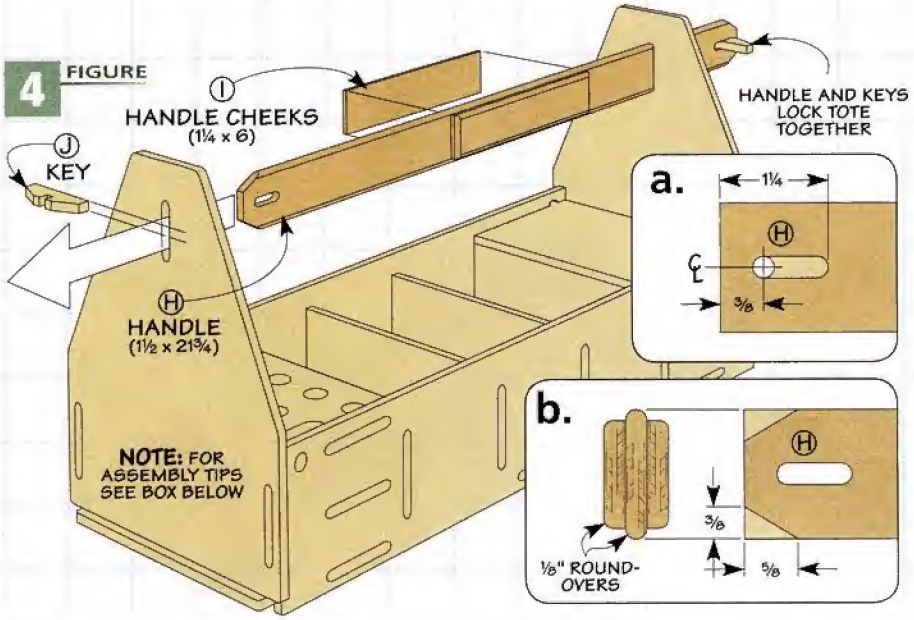
is sized to accept the keys. The quickest way to make these short slots is to drill overlapping holes with a Forstner bit and smooth the edges with a file. Each end of the handle is "dog-eared." This makes it easier to fit in the slot in each end and it softens the sharp corners.

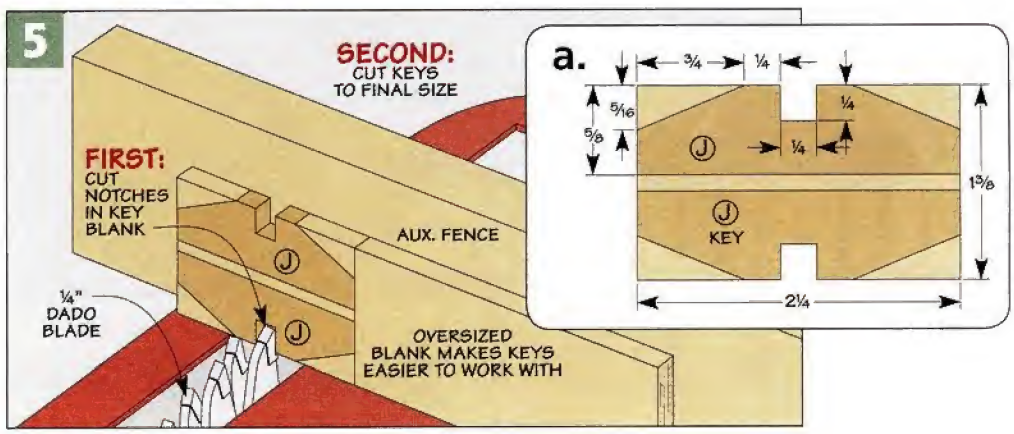
I also glued a set of cheeks to the middle of the handle. These ¼" plywood strips build up the handle for a more comfortable grip.

**Keys.** Like I said, the handle is held in place with keys. To keep them from working loose, a small notch in each one locks them into the handle. Cutting the notch on such small parts can be a challenge. To do it safely, I started with an oversize blank to make the notches, as shown in Figure 5. Once this is complete, you can simply cut the keys apart and trim them to shape.

At last, all the parts of the tote are ready for assembly. The box below will take you through the three easy steps.

Once it's together, you can gather up all your tools and load up the tote. Now you're ready for any task — in or out of your shop.



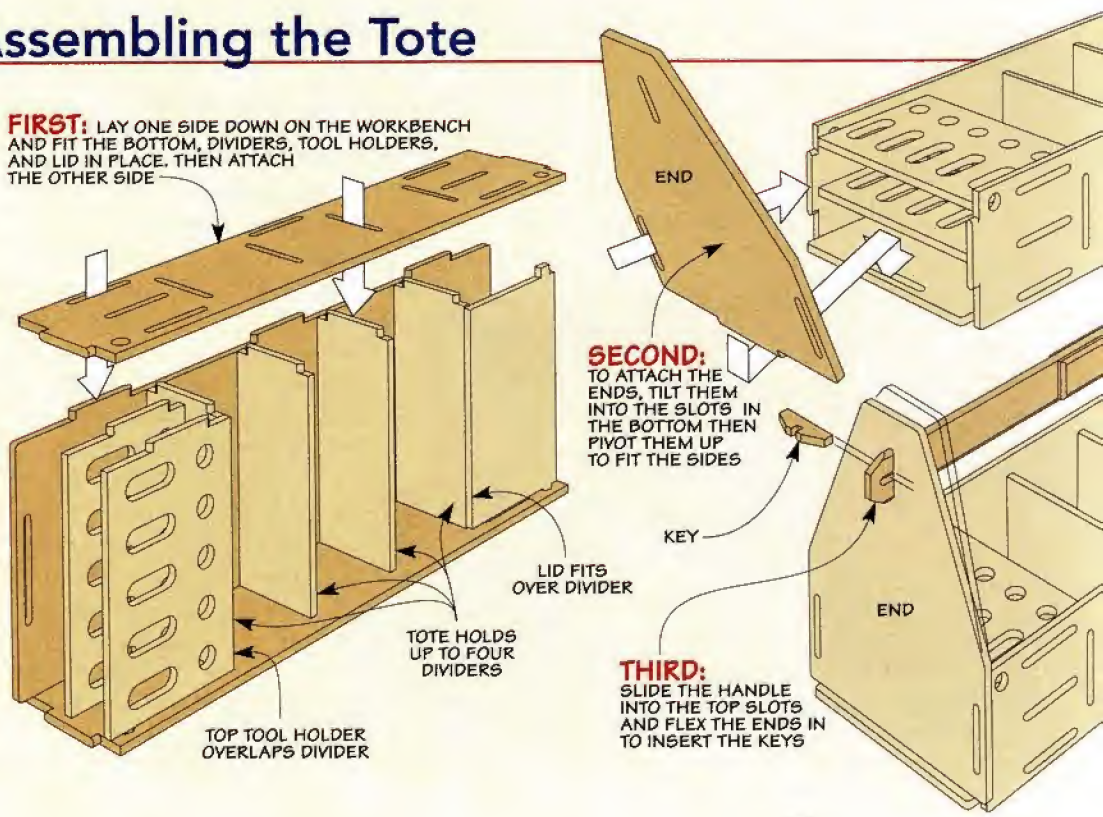




## Step-by-Step: Assembling the Tote

Unlike a lot of projects that you can put together in stages, you'll need to assemble this one all at once. Thankfully, you don't need to worry about the glue. But as you might imagine, there is a trick to it.

Here's how it works: Start with one side sitting on your bench (left drawing). Now, place the tabs in the tote bottom in the slots in the side. Then slip all the organizers and lids in place. After setting the other side in place, you're ready for the handle and ends.

The upper right drawing shows how the ends drop into the bottom and tilt upright to fit the sides. To fit the keys into the handle, you'll need to flex the ends a bit, as you can see in the lower drawing. The ends will pin the keys in place.



PROJECT
Technique

# working with Aluminum

## A few simple tools and techniques make it easy to get great results with aluminum.

A lot of woodworking projects also require working with metals like aluminum. As a matter of fact, working with aluminum is a lot like working with wood. And you probably already have a lot of the tools you need in your shop. But there are a couple of things you might want to know to make it easier to cut, drill, tap, and rivet aluminum for a professional look.

**Hole Layout.** One of the most common operations you do when working with aluminum is drilling holes. But before you can do that, you need to locate them. I use a scratch awl or metal scribe to mark the centerpoint. This way, you'll get a fine line that won't smudge.

Once you've laid out the location, a spring-loaded center punch is the tool to reach for. (It's the tool on top of the metal file in the photo above.) When you press on it, the spring makes the punch "snap," putting a small dimple in the aluminum. This gives the drill bit a good starting point and keeps it from wandering as you start to drill the hole.

▲ ***Drilling.*** *Secure clamping and lubrication (inset photo) are keys to drilling clean, accurate holes.*

**Drilling.** When you're drilling in aluminum (or other metals), the bit has a tendency to grab the workpiece. If the piece isn't securely clamped to your drill press table, it can spin around like an airplane propeller. Or when you try to pull the drill bit out, the bit lifts the workpiece right off the table.

To solve this problem, I always make sure to clamp the workpiece down securely. In the photo at left, you can see a jig I made for this purpose. It not only keeps the workpiece from spinning, but the rabbeted blocks also hold the workpiece firmly against the base.

**Cooling Off.** One problem you can run into when working with aluminum is heat. Friction from drilling, cutting, and tapping threads can heat up cutting tools in a hurry. And heat is hard on tools. So if I'm going to be drilling a lot

▲ ***Riveting.*** *A few taps with a ball pein hammer will "mushroom" the ends of the rivets for a tight fit.*

▲ ***Filing.*** *A file makes quick work of smoothing the rivets flush with the surface of the workpiece.*

of holes, I like to use a lubricant to reduce friction and heat buildup.

Now there are all sorts of liquid coolants and lubricants you can use. But most create quite a mess. So I like to use a wax-like lubricant (inset photo at bottom of opposite page). You simply touch the stick to your drill bit while drilling. And the heat from drilling melts the lubricant, reducing friction.

**Tapping Threads.** Another operation that can generate a lot of friction is tapping threads. Even though aluminum is relatively soft and easy to tap, I still like to use a few drops of lubricant. You can buy cutting fluid specifically designed for aluminum (main photo on opposite page). It makes tapping easier and cuts cleaner threads.

**Riveting.** For some projects, like the squares on page 36, you want a permanent assembly. In this case, a simple rivet will do the job.

But there's something I've learned about using aluminum rod for rivets. If the rivet doesn't slip all the way into the hole fairly easily, you can't force it in with a hammer. That's because the aluminum will expand as you try to drive it in.

So, I like to make sure the rivet slips freely all the way into the hole before I touch it with a hammer. Then once the rivet is fully seated, it's easy to "mushroom" the ends to lock it in place (left photo above).

**Final Smoothing.** On a riveted assembly, there are a few more things to finish up. For the rivets, all you need is a metal file to cut them flush, like you see above. And since the edges of bar stock can be a little rounded as they come from the supplier, you can square them up with a carbide blade on the table saw (upper right photo). A push block and a very light cut make it an easy and safe operation.

The next thing to do is sand all the surfaces smooth. The inset photo above shows a trick for keeping the edges square. And finally, the box below shows you how to protect and polish aluminum for a professional finish on your project.

▲ ***Tapping Threads.*** *Cutting threads in soft aluminum is a snap with a hand tap and lubricant.*

▲ ***Trimming Edges.*** *A notched push block makes it safe to trim aluminum with a carbide blade.*

► ***Sanding.*** *To keep the sides square and sanding marks straight and even, use the rip fence as a guide.*

## Surface Protection: Wax or Lacquer

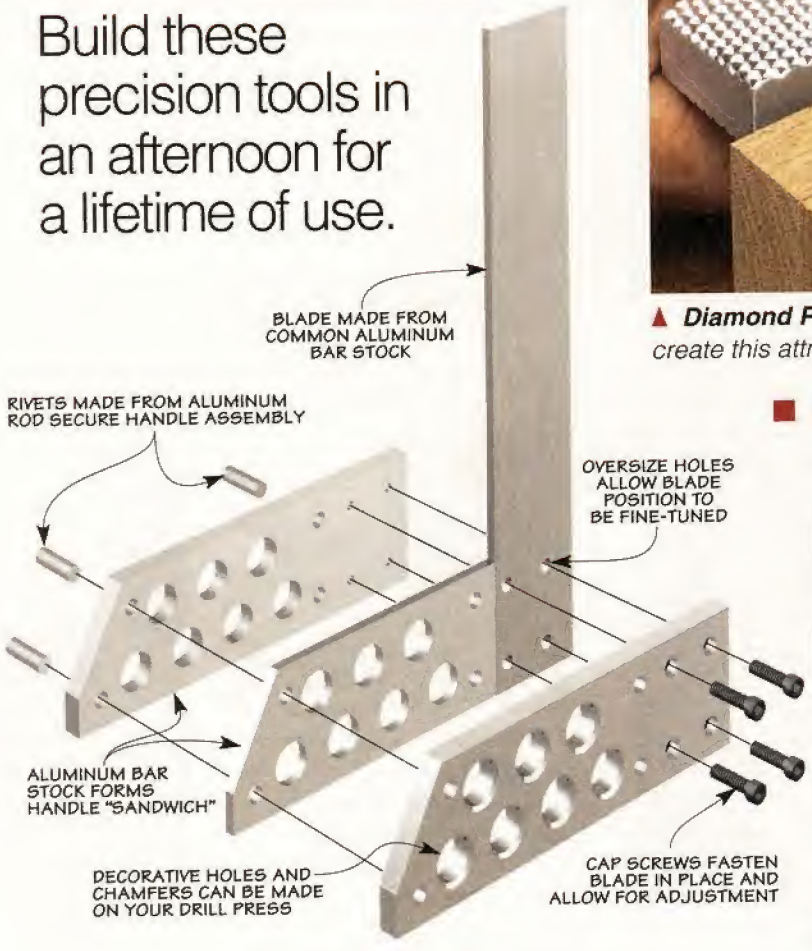
▲ ***Wax.*** *A couple coats of paste wax adds a nice gloss and keeps the aluminum from staining your hands black.*

► ***Lacquer.*** *Another option is a coat of lacquer to add long-lasting protection and shine to your aluminum projects.*

# aluminum Squares

Build these precision tools in an afternoon for a lifetime of use.

▲ ***Diamond Pattern.*** *With a simple sled for your table saw, you can create this attractive diamond pattern. For details, refer to page 17.*




**EXPLODED VIEW**

A good square is one tool that's indispensable in the shop. I use it on just about every project I build. But some squares aren't all that accurate. And with most squares, there's no way to adjust them if they get knocked out of alignment and aren't a perfect 90°.

That's why I like the design of the squares you see here. Not only can you customize them to your liking, but they're adjustable. What I mean is if they should ever lose their accuracy, there's an easy fix. Four cap screws hold the blade securely to the handle of the square (photos above). If the blade ever gets knocked out of square, you can loosen the screws, adjust it back to 90°, and then retighten the screws.

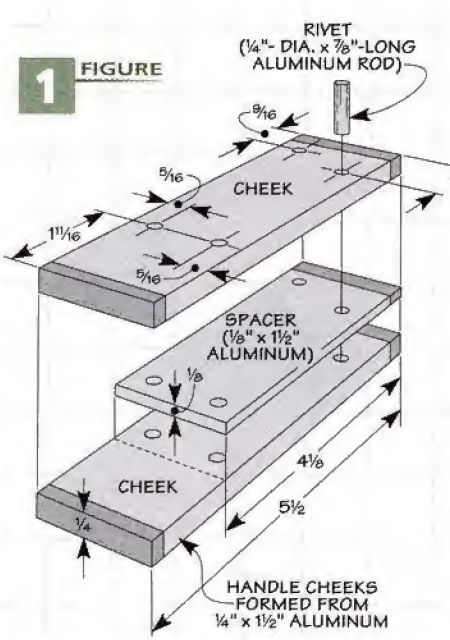
The really nice thing about these squares is they're easy to build with common shop tools. In a nutshell, you'll take readily available aluminum bar stock and laminate it to form the handle, as shown at left. Finally, after attaching the blade and adjusting it, you're ready to put the square to use in your shop.

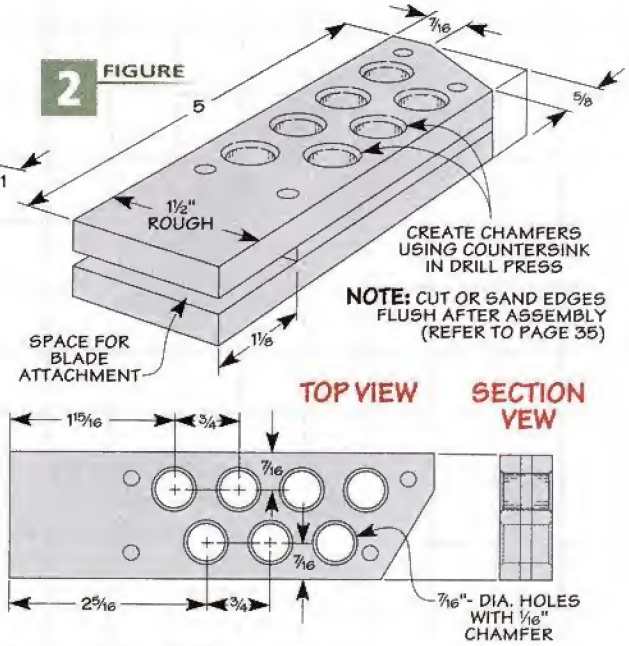
**Make a Sandwich.** The starting point of the square is the handle. It's a simple lamination (Figure 1). The middle piece of the sandwich is the same thickness as the blade stock. But it's a little shorter than the outer pieces to leave room for the blade you'll add later.

If you've never worked with aluminum before, don't let it worry you. Check out the tips and tricks starting on page 34. They'll help you get great results when you make your square.

There's one more thing I'd like to mention. You'll be spending quite a bit of time at the drill press. So to make the task easier and safer, I used the drilling jig shown on page 16. It securely holds the handle blank for accurate drilling.

**Layout.** To start on the assembly, I first cut the pieces to rough length and stacked them together. Then it's just a matter of laying out the hole locations using a metal scribe and a spring-loaded center punch. Once all the layout is done, it's time to step over to the drill press.




**Assembly.** You can follow the steps in the box below to complete the handle. It's not as hard as you might think. It just takes time to accurately drill all the holes.

I started by drilling the rivet holes and then locking everything together with the rivets. This made it easier to work on trimming the blank to size and drilling the decorative, "Swiss cheese" holes you see above. Once that's all done, you can move on to adding the blade.

## Making the Handle

Making the handle of the square involves a few simple steps outlined here. There's a lot of drilling, so make sure you have some sharp bits on hand.

To start out, you'll want the laminated aluminum blank clamped securely in a drilling jig (refer to page 16). Then follow the steps here to drill the rivet holes and pin the "sandwich" together.

After you file the mushroomed ends smooth and trim the edges of the blank, you can drill the decorative holes.

▲ ***Rivet Holes.*** *Drill ¼"-dia. holes for the rivets, then check the fit. The rivets should slip easily into the hole and completely through to the other side of the blank.*

▲ ***Adding Rivets.*** *A spacer raises the handle so you can "mushroom" the ends of the rivets. Remove the spacer and flip the blank over to peen the other side.*

▲ ***File Flush.*** *A coarse file makes quick work of removing the excess material from the rivets. File just until the rivets are flush. You'll sand them smooth later.*

▲ ***Trim Edges.*** *Use a carbide-tipped blade to trim the blank to final length and square up the sides. Then trim the corner off the end as shown in Figure 2.*

▲ ***Hole Pattern.*** *Use a 7/16"-dia. bit to drill the decorative hole pattern on the handle. A countersink forms the 1/16" chamfer around the edge of each hole.*

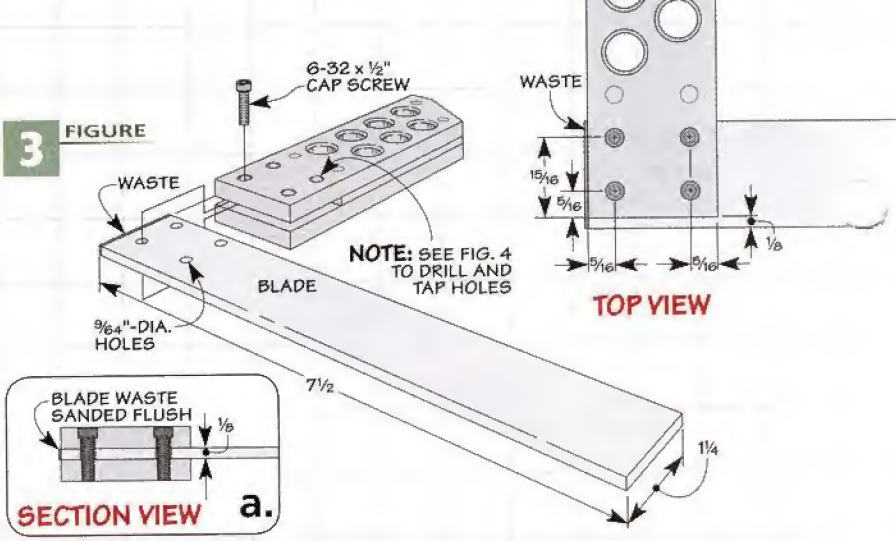
## attaching the Blade

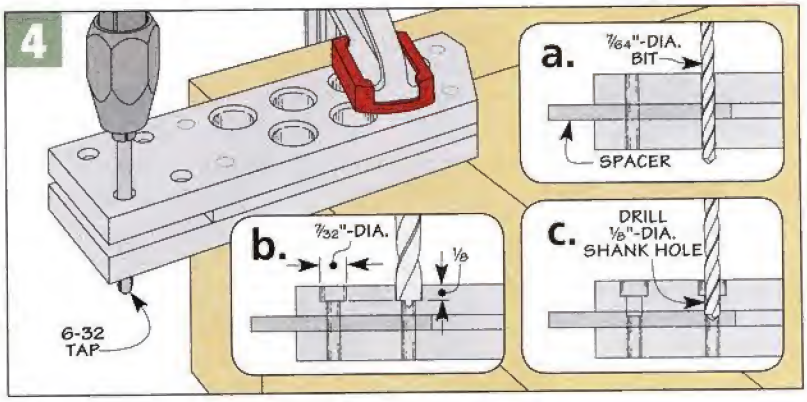
With the bulk of the handle complete, there are still a few things you need to do before you attach the blade. You need to drill and tap the four holes for the cap screws used to fasten the blade to the handle.

Figure 3 shows you where to locate the holes. Then there are three drilling operations to create the stepped and threaded holes. Figure 4 shows you how this is done. I used the *Black & Decker Bullet* bit you see in the left margin to make the counterbore for the screw head (detail 'b'). The shank hole shown in detail 'c' is only drilled through one layer of the handle.

Now you can cut the threads for the screws using a hand tap. The predrilled holes help guide the tap. Finally, you can attach the blade as shown in the box below.

► ***Bullet Bit.*** *The tip design on this bit is ideal for drilling the counterbore for the cap screws.*




## Final Assembly

After the holes are drilled and tapped in the handle, you're ready to attach the blade and adjust it. But before you do anything else, now's the time to trim the edges of the blade square and cut it to size. Then you can sand the blade smooth before you slip it in the handle.

The photos on the right take you through the process of marking and drilling the holes in the blade. What's nice is you'll use the same drill bit you used for the shank holes in the handle. It acts like a center finder to dimple the blade where the holes need to be drilled. Then you can swap out the bit for a slightly larger size and drill the holes. These oversized holes allow the blade to move slightly for an easy adjustment later on.

To fasten the blade, I used cap screws. You can snug them up, but don't tighten them all the way just yet. Refer to Shop Short Cuts (page 16) to learn how to adjust your square to 90°. Once that's done, you can carefully tighten the screws.

Finally, an abrasive pad and a little elbow grease gives your new square a satin look for a professional finish.

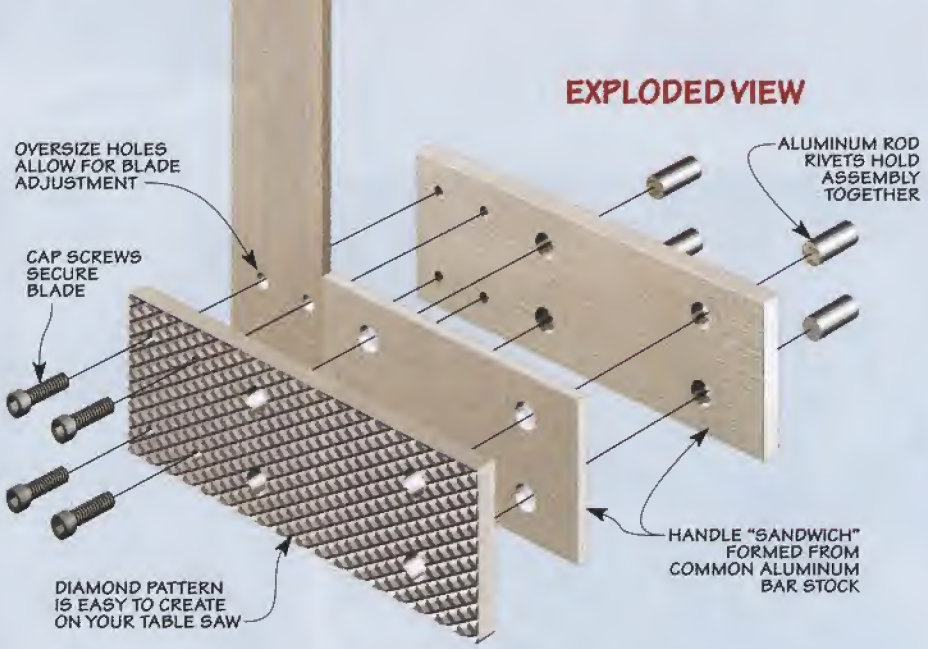
▲ ***Center Finder.*** *Insert the blade into the handle, leaving it a little proud on the back side. Then, to locate the holes, use a ⅛"-dia. drill bit to "dimple" the blade.*

▲ ***Step it Up.*** *Use a 9/64"-dia. bit to drill the oversize holes in the blade. These larger holes will give you some "wiggle room" for adjustment.*

▲ ***Square it Up.*** *A piece of MDF cut at 90° is a great starting point for setting the blade. Once it's aligned perfectly, tighten the screws to hold the blade securely.*

▲ ***Final Finish.*** *After sanding the back edge of the blade flush, smooth out any rough edges and scratches. Then add a coat of wax or lacquer.*

# making a Diamond-Pattern Square

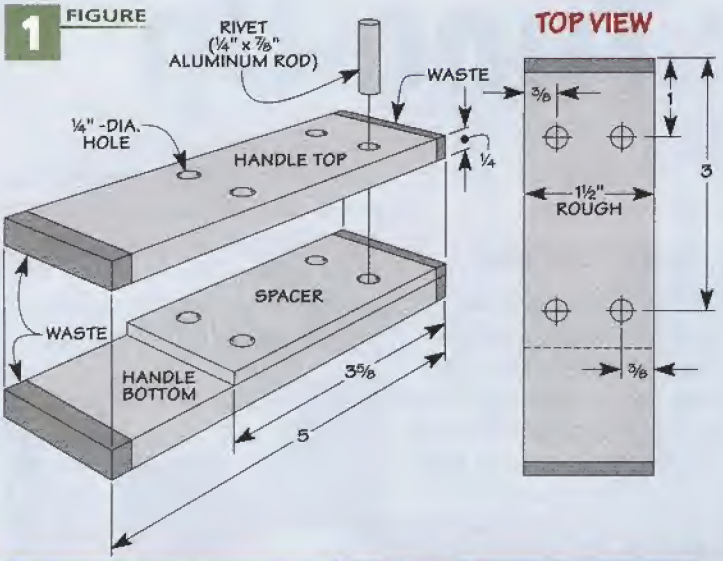


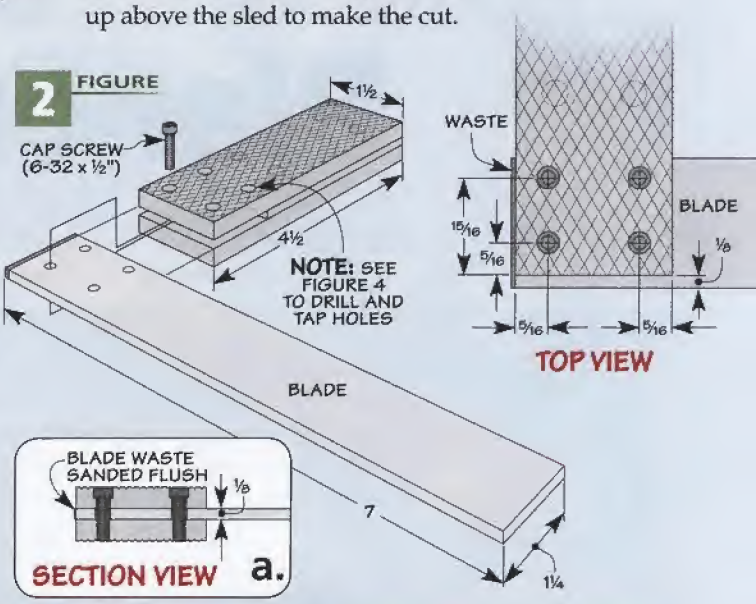

The diamond pattern you see in the inset photo on page 36 gives the square a unique, "industrial" look. You would think it requires some special tooling, but it doesn't. All you need is your table saw and the simple sled shown on page 17.

You'll see in the drawings below what you need to know to build the square. It's a different size, but you put it together the same way as before. And you'll go ahead and drill and tap the holes for the blade before you start making the diamond pattern on the handle.

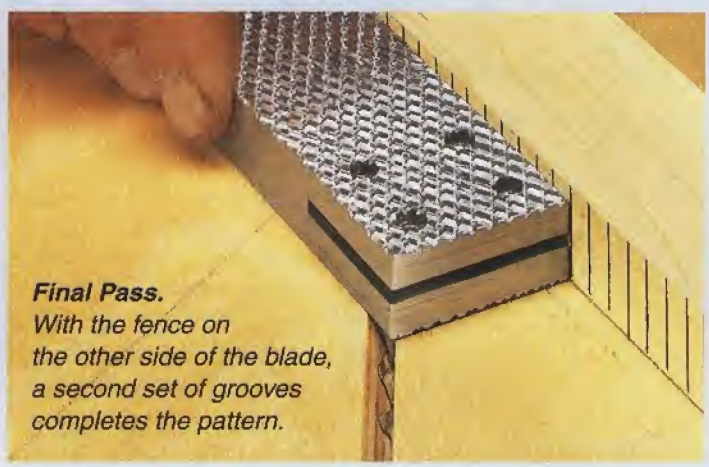
Using the sled to make the diamond pattern is covered in detail on page 17. The pattern is really just a series of shallow, parallel grooves that are cut at an angle to each other, as shown above.

It doesn't take much effort to create the pattern. The photos below show what it looks like as you make the grooves. You'll notice the saw blade barely peeks up above the sled to make the cut.



***First Pass.*** *Using index marks on the fence for spacing, you'll make a series of parallel grooves on the first pass.*



***Final Pass.*** *With the fence on the other side of the blade, a second set of grooves completes the pattern.*

# portable Planer Tune-Up

A portable planer has one basic task — planing a workpiece to a specific thickness with the two faces parallel to each other and perfectly smooth. It's such a simple task that it's easy to take your portable planer for granted. And if you do that, it won't take long for your planer to look a bit rough and ragged, like my 15-year-old planer shown in the inset photo above.

The nice thing is, bringing your planer back to peak performance isn't difficult. All you'll need are a few simple tools and an afternoon. The tune-up process starts with cleaning and lubricating the important parts. Follow that up with some basic adjustments and you'll be well on your way to a planer that looks and, more importantly, runs like the day you bought it, as in the main photo.

Note: The tune-up steps shown here cover the majority of portable (12" to 13") planers. Still, it's a good idea to refer to your owner's manual before you get started and any time you have questions.

## START WITH CLEANING

As you can see in the photo above, chips and sawdust can work their way throughout the planer, gumming up the works. So the first step is to give the planer a thorough cleaning. Safety Note: Unplug your planer before starting any work.

**Open It Up.** To get into all the nooks and crannies of the planer, I find it easiest to remove the side panels and the dust chute/guard assembly. And for many planers, removing the top cover will provide better access to the cutterhead and the rest of the planer interior.

▲ ***Remove the Grime.*** *After spraying on a cleaner, simply wipe the pitch, resin, and grime away.*

***Dealing with Rust.*** *A fine synthetic pad and some cleaner make quick work of removing rust buildup on the posts of the planer.*

Once you have easy access to the planer, you're ready to start cleaning. The first thing I like to do is vacuum up as much of the dust and chips as I can. After that, a couple shots from an air hose takes care of the hard-to-reach areas.

**Pitch & Resin.** There is one problem area that will take a little more effort than a quick vacuuming. And that's cleaning up the caked-on pitch and resin left behind by all the workpieces run through the planer.

I like to take care of the pitch and resin with a mild, spray-on blade and bit cleaner, like the one shown in the inset photo on the opposite page. Simply spray it on and give it time to cut through the grease and grime, then wipe away the mess (photo at lower right). Note: Mineral spirits will also work, but avoid "hot" solvents like lacquer thinner that may damage the paint, drive belts, and rollers.

## REMOVE THE RUST

A basic cleaning will make any portable planer look a whole lot better. Unfortunately, it can also reveal another problem area that will need work — surface rust.

In the inset photo on the opposite page, you can see that the posts on my planer were quite rusty. To ensure the cutterhead moves up and down smoothly, it's important for the posts to be clean and smooth. All it takes to remove the rust is a little elbow grease, a fine synthetic pad and some lubrication. (I use the cleaner as a lubricant.) While I'm at it, I usually clean up any other rusty areas I see — except for the cutterhead. (I wait on the cutterhead until the knives are removed.)

## LUBRICATION

At this point, things are starting to look pretty clean. So the next step in the process is to make sure it stays this way for as long as possible.

To do this, I like to use paraffin wax on the two spindles used to adjust the cutterhead up and down (lower left photo). Just rub a "bead" along the threads and then crank the cutterhead all the way up and down a few times to work the wax in. To avoid attracting dust on the threads, be sure to wipe away any excess.

Once the spindles are waxed, I take a little time to apply some wax on the guide posts of the cutterhead, too. Simply rub it on and then buff it out with a clean cloth.

**Drive System.** Next, I turn my attention to the drive system that provides power to spin the cutterhead and drive the feed rollers. These parts are connected to the motor via chains and a belt.

For the drive belt area, all I do is blow out any dust or debris. But the chains are often covered with a heavy grease. So the dust and chips buildup can be pretty thick. After wiping down the chains to remove most of the mess, I make sure I re-lubricate them by using spray-on white lithium grease (right photo below).

With everything cleaned and lubricated, you're ready to move "inside" and inspect how well the planer is set up and adjusted. For more on this, you can turn the page and get started.

**Specific Problems.** If you have a specific problem you'd like to get working on, check out the troubleshooting box above. It covers the common problems you're likely to run across and how to fix them.

## Troubleshooting

**RIDGES IN WORKPIECE**
- *Knives are nicked or chipped* — shift one knife or replace/resharpen knives

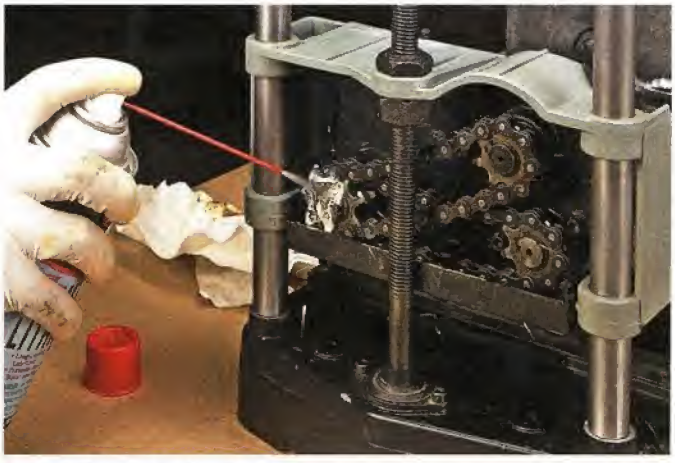
**GLAZED OR BURNISHED WORKPIECE**
- *Knives are dull* — replace or sharpen

**WORKPIECE FEEDS UNEVENLY OR STOPS**
- *Dust and pitch buildup on feed rollers* — clean feed rollers
- *Insufficient or uneven feed roller pressure* — adjust feed rollers lower or increase spring tension on rollers per owner's manual (some planers)

**THICKNESS OF WORKPIECE TAPERS ACROSS WIDTH**
- *Cutterhead and/or knives misaligned* — check that head is parallel to planer bed then reset knives to cutterhead

**EXCESS SNIPE ON WORKPIECE**
- *Outfeed tables misaligned* — adjust outfeed tables parallel with the bed of the planer

▲ ***Protection.*** *Paraffin wax on the posts and spindles of the cutterhead provides protection and allows for smooth movement.*



▲ ***Adding Lubrication.*** *After cleaning dust and chips out of the drive chain area, a spray-on lubricant is all it takes to keep the gears and drive chains running reliably.*

# completing the Tune-Up

With the outside of the planer cleaned up and the drive system lubricated, you're ready to turn your attention to the "inside" and check out the feed system, cutterhead, and knives. After that, all that's left are a couple small details to make the tune-up complete.

## SAFETY & CLEANING

Before working inside the planer, it's a good idea to remove the knives. This way, you won't have to worry about accidentally cutting yourself. (In my case, the knives were in definite need of replacement, as you can see in the margin on the opposite page.)

Removing (and reinstalling) the knives is a fairly easy task that most owner's manuals cover quite well. Usually it's just a matter of loosening the bolts of the gib assembly that holds the knife in place. To make things even simpler, newer planers feature a locking bar that securely holds the knife. Just unbolt the bar and lift the knife out.

▲ ***Clean the Cutterhead.*** *After removing the knives, a brass brush and cleaner make quick work of removing pitch and resin (above). And here again, any surface rust can be buffed away (inset).*

**Clean Up Again.** Once the knives are out, you'll want to clean up the cutterhead. Since this is where the "rubber meets the road," it's likely to have a lot of pitch and resin buildup. After removing any buildup (inset photo above), take care of the rust as before and follow that with a coat or two of wax. Although you could reinstall the knives at this point, I find it best to wait until the rest of the interior cleaning and adjustments are complete.

## FEED ROLLERS

The next thing to focus on is the feed roller system. After a lot of use, your feed rollers may end up like mine. They didn't grip the workpiece as well as they used to, causing it to feed erratically and occasionally stopping altogether.

Dust and pitch buildup on the roller is the likely cause for this. You can easily remove it with a rag soaked in some cleaner (margin at left). Note: To get to the entire roller, you'll have to manually rotate the cutterhead belt to turn the rollers. And since they feed at a slower rate than the cutterhead rotates, it'll take quite a few turns.

***Feed Rollers.*** *To improve the feed performance, clean dust and pitch off the rollers.*

## CUTTERHEAD

Once the rollers are cleaned up, you can turn your attention back to the cutterhead. For consistent thickness across the width of a workpiece, it's important for the cutterhead to be parallel to the planer bed.

**Flat Bed.** The bed provides a flat reference surface for the workpiece as it passes under the cutterhead. What's important here is to keep the bed cleaned and waxed for smooth movement. And if the bed is covered with sheet metal, just be sure no dust or debris has worked its way underneath.

**Checking the Alignment.** If you've noticed your workpiece is tapered across its width, the most likely problem is a misaligned cutterhead. To check this, I use a shop-made reference block like the one shown in the photo at left.

To check the alignment, adjust the cutterhead until the block just slips beneath it. If the cutterhead is parallel, you should be able to slide the block smoothly from one end of the cutterhead to the other.

If the block is loose or tight at one end or the other, you'll need to adjust the cutterhead. To do this,

► ***Align the Cutterhead.*** *An alignment block makes it easy to check that the cutterhead is parallel to the bed.*

## Maintenance Schedule

| TASK | EACH USE | 5HRS | 10HRS | 50HRS |
|---|---|---|---|---|
| Chip deflector/guard in place | X | | | |
| All fasteners and locks secure | X | | | |
| Brush/blow out chips and dust | X | | | |
| Clean and wax cutterhead, rollers, posts, bed, and spindles; clean rollers | | X | | |
| Inspect knives | | X | | |
| Check tightness of gib bolts | | | X | |
| Check thickness scale alignment | | | | X |
| Clean and lubricate chains and belt area | | | | X |

it's best to consult your owner's manual first. For my planer (and many others), this is just a matter of loosening the nut at the top of the threaded spindle that sandwiches the cutterhead in place. After adjusting the elevating nut underneath to align the cutterhead parallel, simply retighten the upper nut.

### INSTALL THE KNIVES

After rechecking the cutterhead alignment, the next step is to reinstall the knives. As I mentioned earlier, your owner's manual should cover this in detail.

Knives that index to the cutterhead are easy to install since they slip in and align automatically. For other planers, you'll need to use a knife-setting gauge to place the knives in the right position. Doing this isn't all that difficult, but if your planer doesn't have a cutterhead lock, a pair of small wedges will keep the cutterhead in place while you work (upper right photo).

While the knife-setting gauge ensures the knife is installed in the right position, it's also important to methodically snug up the gib bolts to keep it from shifting. I like to work from the center out, first just snugging up each bolt to hold the knife in place. Once that's done, you can securely tighten all the bolts, again working from the center out.

### OUTFEED TABLES

With the knives in place, you're ready to set the outfeed tables parallel with the bed of the planer.

▲ ***Outfeed Tables.*** *To minimize snipe, adjust the outfeed tables parallel with the bed of the planer using shop-made levelers (top) or the built-in adjustment screws (left).*

▲ ***Setting the Knives.*** *You'll get a big improvement in how your planer works by replacing old knives with new ones (margin at right). A knife-setting gauge makes the process easy and safe (above).*

A straightedge is all you need for this (lower left photo).

My tables are simple sheet metal assemblies. Unfortunately, they rest a little below the bed of the planer. This doesn't provide solid support for the workpiece and often results in snipe (a deeper cut) at each end of the workpiece. To solve this problem, I made a set of four assemblies with adjustable feet. These assemblies attach to the bottom side of the tables with carpet tape.

You're likely to find flip-down tables on most planers. To adjust them, you'll need to raise or lower an adjustment screw on the base of the planer, like you see in the inset photo at the lower left.

### FINAL DETAILS

All that's left to take care of now are a few details. After reinstalling the panels and covers, make a quick check of the motor brushes. Worn-out or chipped brushes may need replacement (margin at right).

Once you've done that, run a workpiece through the planer to check the overall performance and determine if you need to rework any of the adjustments. Finally, measure the workpiece thickness and reset the depth of cut scale to match.

Your planer should be in top-notch shape at this point. And in the chart above, you'll find a maintenance schedule that will help you keep your planer working great for years to come.

▲ ***Motor Brushes.*** *Remove the motor brushes to check for wear. Replace short, worn-out brushes (lower left) with new ones (upper right).*

# 5 easy ways to Turn Down the Noise

## Here are five simple solutions for reducing the noise in your shop.

When it comes to working with power tools, noise is a fact of life. But it's more than just a minor annoyance — long-term exposure to the noise from power tools can cause hearing loss. The first line of defense is good hearing protection, like a set of earmuffs or earplugs. But here are a few other simple solutions for turning down the volume in your shop.

## 1 Enclose the Tool

One of the simplest ways to deal with a loud tool is to contain the noise by enclosing it in a cabinet or stand. This works great for shop vacuums, air compressors, or router tables (photo above).

The enclosure doesn't have to be anything elaborate, as long as it seals out as much of the sound as possible. MDF and plywood are both good choices for building enclosures because they're dense and heavy, which helps absorb sound waves and vibrations.

Note: Most tools require a source of ventilation in order to prevent heat build-up within the motor. So make sure that you don't seal off the tool completely.

Adding extra weight (like a bag of sand or some concrete blocks) to the bottom of the enclosure acts as an anchor to further aid in reducing noise and vibration.

## 2 Reduce Vibration

When it comes to stationary, belt-driven power tools, vibration is one of the biggest contributing factors to noise. The first step in reducing vibration is to make sure the pulleys are aligned and securely attached to their shafts.

If this doesn't alleviate the problem, try replacing the stock V-belt and die-cast pulleys with a link belt and machined steel pulleys, like those shown at right. These components run smoother than the ones that most likely came with your tool and they can greatly reduce the amount of vibration.

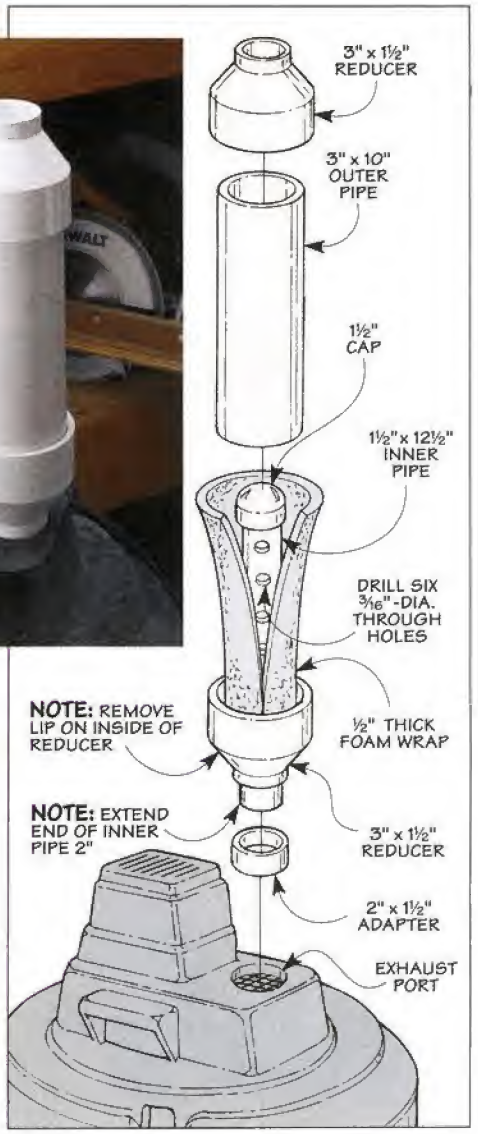
## 3 Muffle the Noise

If you were to make a list of the tools that are the worst noise offenders, the shop vacuum would rank near the top.

But if your shop vacuum has an exhaust port that will accept a hose, you can make a muffler that will cut the noise level almost in half. The muffler is nothing more than insulation foam housed in a PVC pipe and fitting assembly (drawing at right).

The concept of the muffler is simple. A layer of flexible foam insulation fits between the walls of an inner and outer pipe. The smaller inner pipe is drilled with several holes and then capped. This way, air from the vacuum is expelled through the holes and then passed into the foam. The foam dampens the sound, and then the air is forced out through a reducer at the top of the muffler.

I assembled the muffler using PVC cement. Then to fit the muffler into the exhaust port of my shop vacuum, I used a simple adapter fitting around the inner pipe, like the one shown in the drawing.




## 4 Stabilize the Blade

Another common source of noise is the blade in your table saw. Blade manufacturers have come a long way as far as developing blades that run quieter and with less vibration. But some blades still seem to have an ear-piercing ring to them.

Fortunately, there's a simple solution. Adding a blade stablilizer (photo at left) to your table saw can help quiet down a noisy blade. The stabilizer is nothing more than a flat, ground-steel plate that stiffens the blade to prevent it from flexing, thereby cancelling out much of the noise.

## 5 Isolate the Noise

Even though there are ways to minimize tool vibration, it's nearly impossible to eliminate it altogether. So in some cases, the next best thing is to simply isolate the vibration before it's transferred to the tool stand. There are a couple of ways you can do this.

The first method is to use isolation mounts (refer to page 51 for sources). These are simply hard rubber cylinders that have either a threaded stud or a threaded hole at either end. The mounts are placed in between the tool and the stand, as shown in the first photo at right.

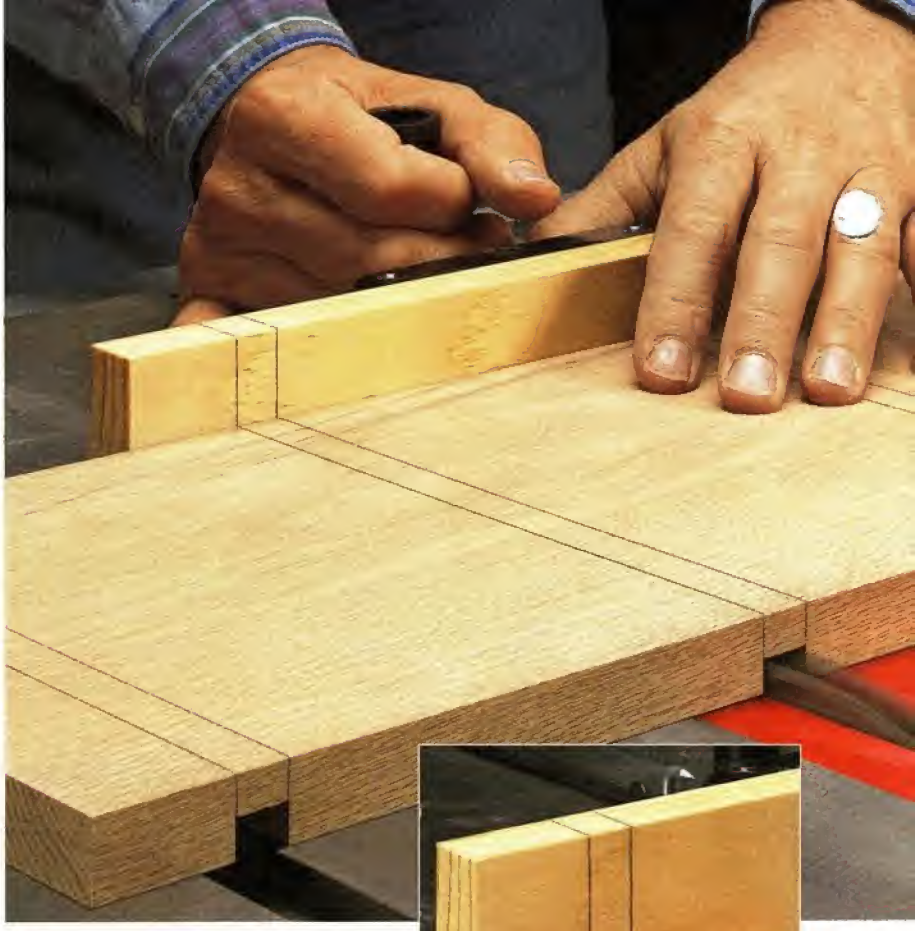
What makes these mounts work is the fact that the mounting bolts thread into each end, rather than passing all the way through the mount. So they act like mini-shock absorbers to cushion the tool against vibration.

Another way to isolate vibration is to use an anti-vibration pad. Typically, this is just a thin piece of rubber or neoprene that is sandwiched between the tool and the stand. The pad can be cut out to match the profile of the tool (right photo below). Or you can cut strips of the material to fit between the frame of a motor and the mounting plate.

MASTERING THE
Table Saw

# setting up for Dead-on Dadoes

With the right setup and a few simple techniques, you'll be cutting perfect dadoes every time.



▲ ***Notch It.*** *A notch in an auxiliary miter gauge fence pinpoints the dado location on the workpiece.*

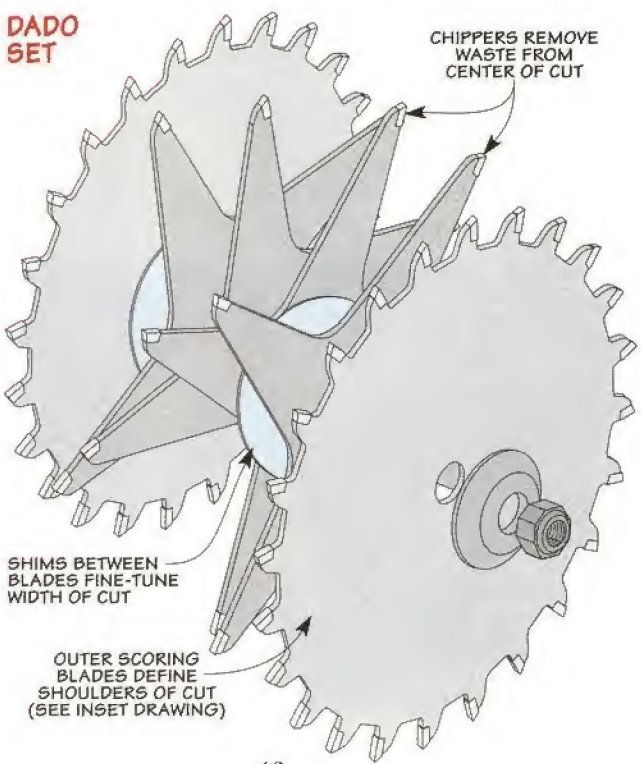
A stacked dado set is the standard tool for cutting grooves, rabbets, and dadoes on the table saw in my shop. Unfortunately, the results can be a bit disappointing at times. The keys to getting better results with your dado blade involves understanding how it works as well as knowing the best ways to set up, lay out, and cut your dadoes.

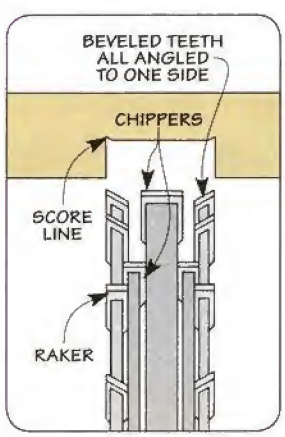
**Setup.** The first step is properly setting up a dado blade. And to do this, it's a good idea to understand how it works. The drawing below shows that a dado set consists of a pair of scoring blades and several chippers.

The scoring blades are the outer blades that resemble standard saw blades. What's different is their teeth are angled either left or right to cut crisp outside edges for the dado (inset drawing below).

Sandwiched between the outer blades are the chippers. These blades are designed to clean out the waste left between the scoring blades. They come in different widths and are combined to create a variety of dado widths.

When installing a dado blade, it's important to remember that the chippers should be staggered. This prevents the teeth from touching



▲ ***Dado Blade Gauge.*** *This shop-made guide helps determine which parts are needed to make the perfect-sized dado.*

each other and getting damaged. And it ensures that all the parts are flat against each other so the arbor nut can be tightened securely.

**Sizing Gauge.** Sizing a dado exactly can take a bit of time. To solve this problem, I made the gauge pictured at the bottom of the opposite page. It has several dadoes to slip workpieces in, and the "recipe" of blades and chippers it took to make those dadoes. Now, it takes just a few seconds to put all the right parts together to accurately size the dado.

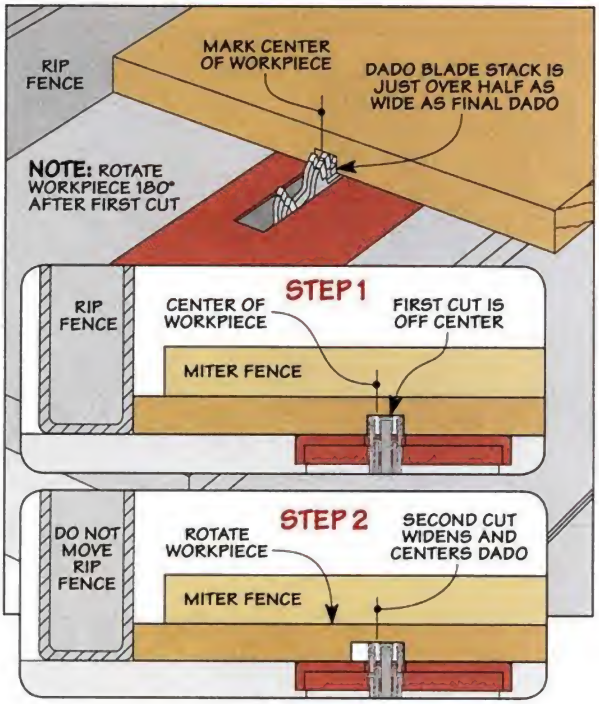
If the dado is still a hair undersized, you can use shims to tweak the final width. And for the best results, place the shims evenly throughout the stack.

**Positioning.** With the sizing and setup complete, the next step is cutting the dado in the right place. One of the challenges is leaning over the table saw to accurately align the layout lines with the dado blade. For better results, I like to cut a notch in an auxiliary miter fence and then draw layout lines on the fence to show the edges of the cut (inset photo on the opposite page). To prevent tearout, the notch in the auxiliary fence is the same depth as the dado.

Next, I mark the edges of the dado on the workpiece (main photo opposite page). Then, line everything up and make the cut. (For other ways to reduce tearout, check out the box below.)

**Handy Techniques.** For most dadoes, this process works great. But for centered and matching dadoes, I use different techniques.

Centering a dado is a simple two-pass process (drawing above right).



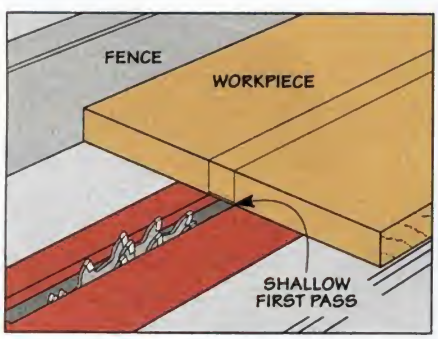

Once you've made the second pass, the dado is automatically centered on the workpiece. However, it may not be the correct width. To get the right width while keeping the dado centered, you can sneak up on it by readjusting the rip fence and repeating the procedure.

For matching dadoes in small projects, I like to start off with an extra-wide workpiece (left photo). After ripping the workpiece to final width (inset photo), the dadoes will match perfectly.

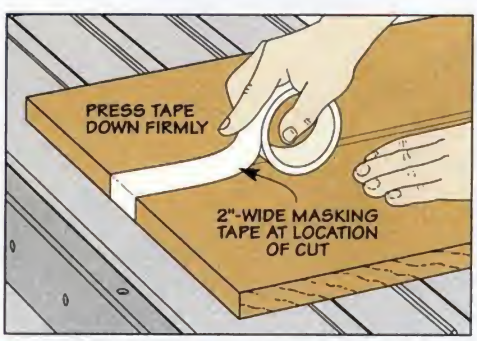
So, you can see that a dado blade is a great accessory to your table saw. And with these simple techniques, you can be sure to get crisp, precise cuts every time.

▲ ***Matched Dadoes.*** *After cutting the dadoes, ripping the workpiece to width provides matched dadoes.*

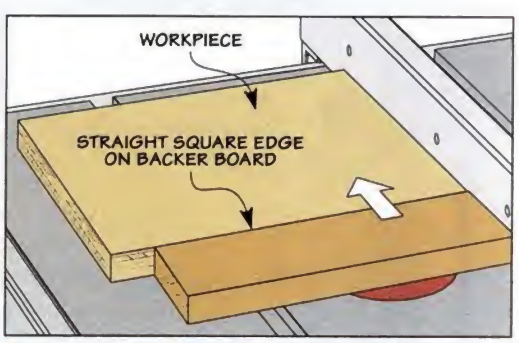
# Tips & Tricks: Avoiding Tearout




▲ ***Shallow Cut.*** *To cut clean shoulders, make a shallow scoring pass before cutting the dado to full depth.*




▲ ***Tape Reinforcement.*** *Masking tape pressed firmly onto the workpiece will reinforce the wood for a chip-free cut.*




▲ ***Back Up the Cut.*** *A backer board is a simple way to prevent tearout at the edge as the dado blade exits the cut.*

▲ ***Fast Action.*** *With each push of the handle, the shaft spins several times to quickly drive screws.*

# Yankee-style Screwdrivers

## Learn how this traditional tool will find new uses in your shop and home.

There's one tool that has been around since the late 1800's and can still find a home in your toolbox today. That's a spiral ratcheting screwdriver, commonly referred to as a Yankee-style screwdriver. In fact, the U.K. division of *Stanley* still makes the original *Yankee*.

**The Secret.** What makes the Yankee-style screwdriver so unique is its spring-loaded spiral shaft. You can see what I mean in the photo above. You'll notice there are two spiral grooves cut into the shaft. One allows the shaft to turn clockwise and works for driving screws and drilling. The other spiral groove works in the counterclockwise direction for removing screws. A slider "switch" in the handle controls the direction. (You'll learn more about that later.)

What you can't see is a spring in the handle that extends the spiral shaft. As you push on the handle, the shaft retracts and rotates several times. Then the spring pushes the handle back to its starting position. It acts like a pogo stick. With a couple of quick pushes, you can drive a screw in a hurry.

**Features.** If you look at the photo below, you'll see a few other features that make this tool so ingenious. At the "business end" is a chuck that's designed to hold a variety of bits. You can get different sizes of Phillips, straight, or square-drive bits for driving screws. And there are even bits you can use to drill pilot holes for screws.

**Using a Yankee.** To get the most out of a *Yankee*, it's a two-handed operation. One hand grips the chuck collar to give you good control. (The shaft spins inside the collar or sleeve of the chuck, which means you can hold tight onto the chuck while driving screws.) The other hand pushes on the handle.

◀ ***Driving Home.*** *Lock the shaft in its retracted position to drive a screw with more power.*

**Lock Down.** If you're in tight quarters, or simply need more turning power, you can retract the shaft and lock it in place as shown in the inset photo above. Now you can use the *Yankee* just like a traditional screwdriver.

**Ratchet Up.** The lower photo on the opposite page shows the three-position slider I mentioned earlier. Moving this slider to the lower position (toward the chuck) sets the direction of the ratcheting mechanism that allows the shaft to turn clockwise. This works whether the shaft is extended or locked in the retracted position. With the shaft retracted, the handle "ratchets" without allowing the shaft to turn independently. Then it's used like a ratcheting screwdriver.

The upper position of the slider works the same way, except it's used for removing screws. And when the slider is in the middle position, it keeps the shaft from rotating in either direction.

**New Options.** If you look at the bits on the opposite page, you'll notice the unusual notches on their round shafts. This was the design of the original *Yankee* screwdriver to lock the bits in place. The problem is, that can limit your bit selection.

The good news is there are a few vendors that still supply bits or adapters to fit a *Yankee* screwdriver (refer to Sources on page 51).

The better news is you can get Yankee-style drivers with a hex chuck. This means you can use the dozens of hex bits available.

You can buy a Yankee-style driver in different sizes to suit specific tasks around the shop and home. But the best news is that once you get your hands on a Yankee-style screwdriver, you'll wonder how you got along without it.

## Trivia: History of the Yankee

The original *Yankee* screwdriver is thought to have been invented by Zachary T. Furbish in the late 1800's. He became an employee of *North Brothers* which was later bought out by *Stanley Toolworks*.

Where did the name "Yankee" come from? The *North Brothers* catalog from 1908 claimed it was because they were invented by a Maine Yankee, but "more particularly because they embodied that ingenuity and slickness in their construction and in the doing of work for which they were intended, which has made Yankee inventions famous the world over."

Other tool companies like *Goodell-Pratt* and *Millers Falls* came out with similar versions. But no matter who made them, most folks still called them a "Yankee."

## Drill and Driver Bits

A Yankee-style screwdriver makes quick work out of driving screws. But its design lends itself to drilling and countersinking, too.

The accessories shown below make it easy to use the right driver or drill bit for any job. You can adapt the round-shank, Yankee-style driver to use hex shank bits. Or you can buy a Yankee-style screwdriver with a hex chuck instead of the traditional chuck. Either option opens up endless possibilities for drilling or driving screws.

Q&A

**questions from**
Our Readers

# easy steps to Air Dry Lumber

*My neighbor gave me a small log from a walnut tree he recently cut down. I would like to mill the log and use the wood in a future project. Since I don't have access to a kiln, what do I need to do the get the lumber dry?*

*Jody Goldie*
*Gloucester, Massachusetts*

***Drying Stack.*** *For best results, build your stack so it's stable and allows plenty of air circulation around each board in the stack.*

The first step to creating usable lumber from a small log is to mill, or cut the lumber to size, with a band saw. Then you're ready to stack and store the lumber for drying. To do this, you'll need to find an out-of-the-way corner of your shop that has good air circulation.

**Build a Base.** After selecting a good location, you can start building a stack like you see in the photo above. It's important to begin with a stable base that allows the boards to lay flat so air can move freely around each board. To accomplish this, you'll need to carefully stack the lumber.

You can begin with a solid base of "two-by" stock and plywood. Just be sure the top surface of the base is even so the boards remain flat as they dry. Then complete the base by laying down a piece of plywood. This acts as a barrier to keep dampness from the ground from wicking into the stack.

**Stickers.** Next, lay out a set of narrow wood strips called "stickers." They separate the lumber from the plywood and allow the air to circulate under the bottom layer. I use dry scrap pieces of hardwood for my stickers.

**Build a Stack.** With the base complete, you can add layers of lumber and stickers. You'll want to be sure to place the stickers between each layer directly over one another to support the boards evenly.

**Top it Off.** At the top of the stack, add another piece of plywood to keep moisture from collecting on the top layer. Then add some weight on top of the plywood to keep the boards flat.

**Paint the Ends.** One problem you're likely to encounter is checking (cracking) in the wood. This is a result of moisture leaving the wood too rapidly. Painting the ends of the boards minimizes checking by allowing the moisture to escape more evenly.

Now, there's one final step. It doesn't take any work, but it's almost always the most difficult task of all — allow enough time for the wood to dry adequately.

**Wait Patiently.** You can expect the lumber to take anywhere from just a few months or up to a year to dry. And if it's dried in an unheated area, the moisture content may only reach about 15-20%. Since the wood needs to be around 6-8% for most projects, you may need to move it to a heated location to finish drying.

Finally, the best way to be sure the lumber is ready is to check it with a moisture meter.

◀ ***Walnut Log.*** *You can turn a rough log into lumber for your next project. After milling, you'll need to dry the wood.*

# Sources

## PLANER STAND

You can get most of the materials needed to build the planer stand on page 18 at your local home center. But a few items may be a little harder for you to find.

I ordered the ¼"-20 star knobs (23838) and threaded inserts (28803) from *Rockler*. These items are also available from *McFeely's*.

The 3" locking swivel casters (31870) make it easy to move the stand around the shop. The casters I used came from *Rockler*.

## DRAWER SLIDES

To make the drawers on your project open smoothly and quietly, you'll need to start with drawer slides like those in the article on page 10. The *Blum* epoxy-coated, low-profile (34843), *Accuride* ¾-extension (39348), *Accuride* full-extension (32482), and *Accuride* over-travel (35627) slides, as well as the face frame brackets for each slide, all came from *Rockler*. These drawer slides are also available from the *Woodsmith Store*.

## ALUMINUM SQUARES

The aluminum squares from page page 36 are easy to build and make a great addition to your shop. But you'll need a few items you may not have around the shop.

You can find the bar stock, spring-loaded center punch, taps, drill bits, and files you'll need at your local hardware store or home improvement center. If you have difficulty finding the bar stock, it can be ordered from *McMaster-Carr*.

You will need a couple of supplies when it comes time to drill and tap the aluminum. To help reduce heat during drilling, I used *Tap-Ease* (1009K22) lubricant. And to make it easier to tap the threads in the aluminum, I used cutting fluid (1413K42). Both of these can be ordered from *McMaster-Carr*.

## YANKEE-STYLE SCREWDRIVER

A spiral ratcheting screwdriver, like those featured in the article on page 48, is a handy tool to have around the shop. If you want one of the original *Yankee* drivers, you'll need to order it from *Garrett Wade*. But you can order other Yankee-style drivers and accessories to go with them from *Lee Valley*, *McFeely's*, and *Highland Woodworking*. Contact information for these sources can be found in the right margin.

## PLANER TUNE-UP

The article on page 40 shows you how to tune up your planer to make it run like new. And everything you need for the job is easy to find.

Most woodworking stores will carry the bit and blade cleaners you'll need for removing pitch and resin. I was able to get a spray can of lithium grease, the synthetic abrasive pads, and the motor brushes I needed to complete my tune-up at a local hardware store.

## FEATHERBOARDS

A featherboard can help you make safe, accurate cuts at the band saw, table saw, or router table. Some of the featherboards on page 14 can be found at your local home center or woodworking store. But a couple of them may be harder to find.

The adjustable, wood featherboard with aluminum hold-down (03K0402) came from *Lee Valley*. I ordered the *Grip-Tite* magnetic featherboard (33072) from *Rockler*. You'll also find them at *Highland Woodworking*, *Woodcraft*, and the *Woodsmith Store*.

## SHOP NOISE REDUCTION

Reducing the noise in your shop is often as simple as adding a few of the items featured on page 44. Rubber isolation mounts and anti-vibration pads are available from both *Reid Tool* and *McMaster-Carr*. I was able to find the link belt, machined steel pulleys, and blade stabilizer at the *Woodsmith Store*.

## MAIL ORDER SOURCES

**Woodsmith Store**
**800-444-7527**
*Accuride Drawer Slides, Blade Stabilizers, Star Knobs, Link Belts, Featherboards, Machined Steel Pulleys*

**Rockler**
**800-279-4441**
**rockler.com**
*Accuride Drawer Slides, Blade Stabilizers, Face Frame Brackets, Featherboards, Jig-It for Accuride Slides, Kreg Magnetic Slide Mount, Locking Swivel Casters, Star Knobs, Threaded Inserts*

**Lee Valley**
**800-871-8158**
**leevalley.com**
*Featherboards, Yankee-Style Screwdrivers*

**McMaster-Carr**
**630-600-3600**
**mcmaster.com**
*Aluminum Bar Stock, Anti-Vibration Pads, Cutting Fluid, Tap-Ease, Rubber Isolation Mounts, Yankee-Style Screwdrivers*

**Highland Woodworking**
**800-241-6748**
**highlandwoodworking.com**
*Featherboards, Yankee-Style screwdrivers*

**McFeely's**
**800-443-7937**
**mcfeelys.com**
*Star Knobs, Threaded Inserts, Yankee-Style Screwdrivers*

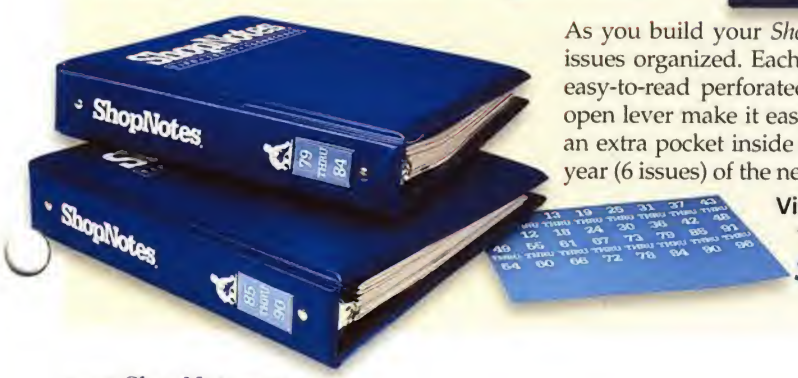
**Garrett Wade**
**800-221-2942**
**garrettwade.com**
*Featherboards, Yankee-Style Screwdrivers*

**Woodcraft**
**800-225-1153**
**woodcraft.com**
*Blade Stabilizers, Magnetic Featherboards*

**Reid Tool**
**800-253-0421**
**reidtool.com**
*Anti-Vibration Pads, Rubber Isolation Mounts*


## ShopNotes Binders

**Keep your issues organized!**




As you build your *ShopNotes* library, here's a way to keep your issues organized. Each binder features durable vinyl covers and easy-to-read perforated number tags. Snap rings with a quick-open lever make it easy to insert and remove issues. And there's an extra pocket inside for storing notes. Each binder holds a full year (6 issues) of the new, expanded *ShopNotes*.

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# Scenes from the Shop

▲ ***Shop-Built Square.*** *A great project starts with an accurate layout. And this shop-made square is up to the task. The design allows the blade to be quickly adjusted to a perfect 90°. For detailed building instructions, turn to page 36. Working with the aluminum used to build the square will take some new techniques and tools, like the ones at left. To learn more about how to get the best results, check out the article that starts on page 34.*